EU-REI
Creating a Resource Efficient India

EUROPEAN UNION

सत्यमेव जयते
NITI Aayog

FICCI

Unified National Circular Economy Measurement Framework-Automotive Sectoral Guidelines

accenture

EU-REI
Creating a Resource Efficient India

EUROPEAN UNION

NITI Aayog

FICCI

Unified National Circular Economy Measurement Framework-Automotive Sectoral Guidelines

accenture

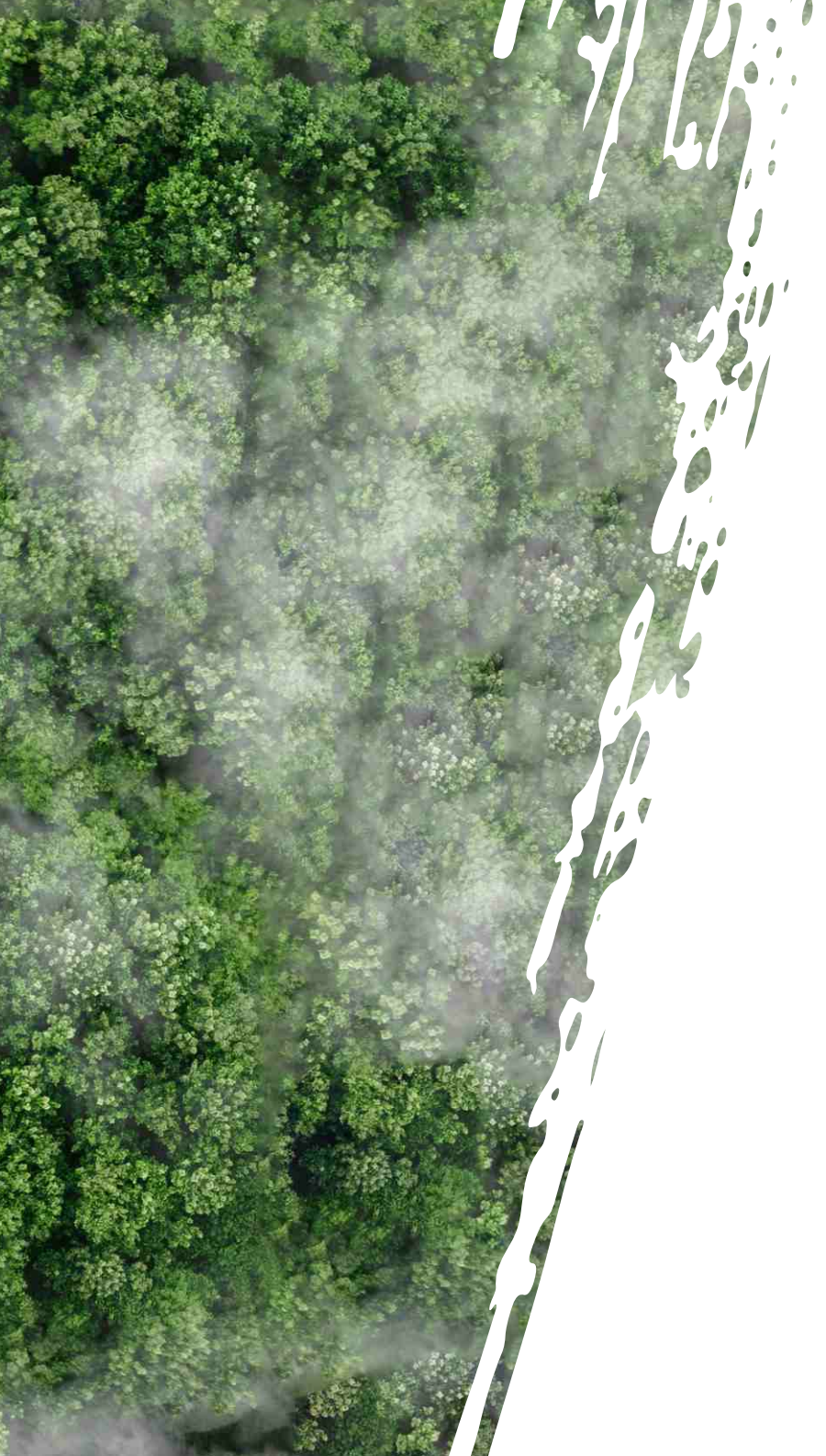


Table of **Contents**

Dr. V.K. Saraswat
Member, NITI Aayog

सत्यमेव जयते
NITI Aayog

Foreword

India is spearheading the sustainability agenda among the emerging economies. Under the G20 presidency, India has a significant opportunity to shape the future of major global economies. We are committed to achieve the Net-Zero emissions target by 2070 as announced by our Hon'ble Prime Minister.

Being the world's fifth-largest economy, India's material consumption and resource demand is rapidly growing, with 65 Mn tons of Municipal waste generated annually and projected to reach 165Mn tons by 2030, acknowledging its significant environmental impact, and it's imperative to encourage sustainable resource consumption and minimize waste. By adopting a circular economy, India can reduce greenhouse gas emissions by 44%.

India's G20 Presidency received a major boost with the launch of the Resource Efficiency and Circular Economy Industry Coalition (RECEIC), a first-of-its-kind initiative aimed at promoting resource efficiency and circular economy practice with participation from 39 global companies. India has already taken strides towards circularity through ambitious policies and regulations, including Extended Producer Responsibility in various sectors like Plastic Management Rules 2022, Battery Waste Management Rules, 2022, Vehicle Scrappage Policy, 2022, Steel Scrap Recycling Policy, 2019, E-waste Management Rule, 2018. Private sector independently is also embracing circular business models to tap into the benefits of circular economy, few of the companies also embracing circular targets and seek to measure circular economy through existing global CE Measurement Frameworks. However, measuring the circular performance across sectors will require addressing the sectoral nuances in adopting the globally established frameworks.

In this context, the sector specific Circular Economy Measurement Implementation playbooks will provide a valuable resource for industry practitioners to measure circularity efficiently. It offers essential insights and guidelines from sector specific perspectives, laying the foundation for introducing and implementing circular economy measurement in India.

I extend my congratulations to FICCI, Accenture, EU REI and NITI Aayog circular economy teams and industry leaders for their dedicated research in producing these well-crafted sector specific playbooks. I am confident these playbooks, including sector-specific implementation guidelines on circularity measurement, will serve as a valuable reference for policymakers and industry practitioners working on circular measurement approaches. I encourage diverse stakeholders and industry leaders to utilize these playbooks/self-assessment toolkits to measure their circular baseline, develop targets and accordingly take actions to achieve their circularity targets.

(Dr. V.K. Saraswat)

Hervé Delphin
Ambassador, Delegation of European Union to India

EU-REI
Creating a Resource Efficient India

EUROPEAN UNION

Preface by **EU REI**

The case for circular economy is imposing itself as countries and societies grapple with the imperative of sustainable development, and with the economic necessity of resources' sourcing and supply chains. This transition is not merely a shift in economic practices; it represents a fundamental reimagining of how we design, produce, consume, and dispose of goods.

Both in Europe and in India, two regions with distinct economic contexts and challenges, the urgency for circularity is particularly pronounced. The demand for resources, the impacts of climate change, and the escalating waste crisis necessitate a paradigm shift towards more sustainable, regenerative practices. Recognizing this, both regions have embarked on the journey towards a circular economy, acknowledging the imperative of reconciling economic growth with environmental stewardship but also the opportunities that may arise with it.

After decades of neglecting this dimension Europe moved and positioned itself at the forefront of the global circular economy movement. The European Union's ambitious Circular Economy Action Plan first established in 2015 and upgraded since, has served as a regulatory catalyst for a holistic transformation, promoting circularity across various economic sectors and policy areas. This initiative not only addresses resource efficiency but also underscores the potential for job creation, innovation, and enhanced competitiveness.

India, as a rapidly growing economy, faces the challenge of delivering economic and social development towards its population while minimizing environmental impacts. The circular economy presents a compelling opportunity for India to de-link economic growth from resource depletion and environmental degradation. The Indian government's emphasis on sustainable development aligns with the circular economy approach. India is well positioned in adopting this 'way of doing' which is also a 'way of being' as illustrated by the LiFE Initiative launched by India that focuses on lifestyles. It draws on Indian own ancestral experiment of sustainable use of natural resources.

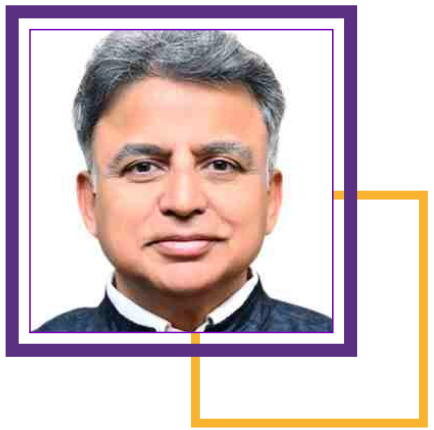
As both Europe and India have embarked on developing their circular and sustainable economy models, the importance of having monitoring frameworks in place for industries cannot be overstated. A robust monitoring framework serves as a compass and a benchmark, providing industries with the tools to assess, track, and improve their circular performance.

The Circular Economy Measurement Framework for Industries in India, developed under the guidance of NITI Aayog and with support from the European Union and its Resource Efficiency Initiative is an important step.

It focuses on particularly critical in sectors such as, automobile, and fast-moving consumer goods (FMCG), where resource intensity as well as economic and environmental impacts are high.

This Measurement Framework aims at being both a catalyst and a roadmap for sustainability, mobilising stakeholders to reassess, reimagine, and recalibrate their approaches to production and consumption.

The transition to a circular economy is a joint endeavour; it is a collective commitment to redefining our relationship with resources and the environment. The fact that this report emanates from a joint initiative between the Government of India, the EU and other key partners speaks for itself of this teamwork. We hope this framework will serve as an inspiration, catalyst, and model for circular economy transitions in India. And that it can foster a mindset—a paradigm shift towards circular thinking that can be adapted, replicated, and scaled across industries and geographies.



Shailesh K. Pathak
Secretary General
FICCI

Preface by **FICCI**

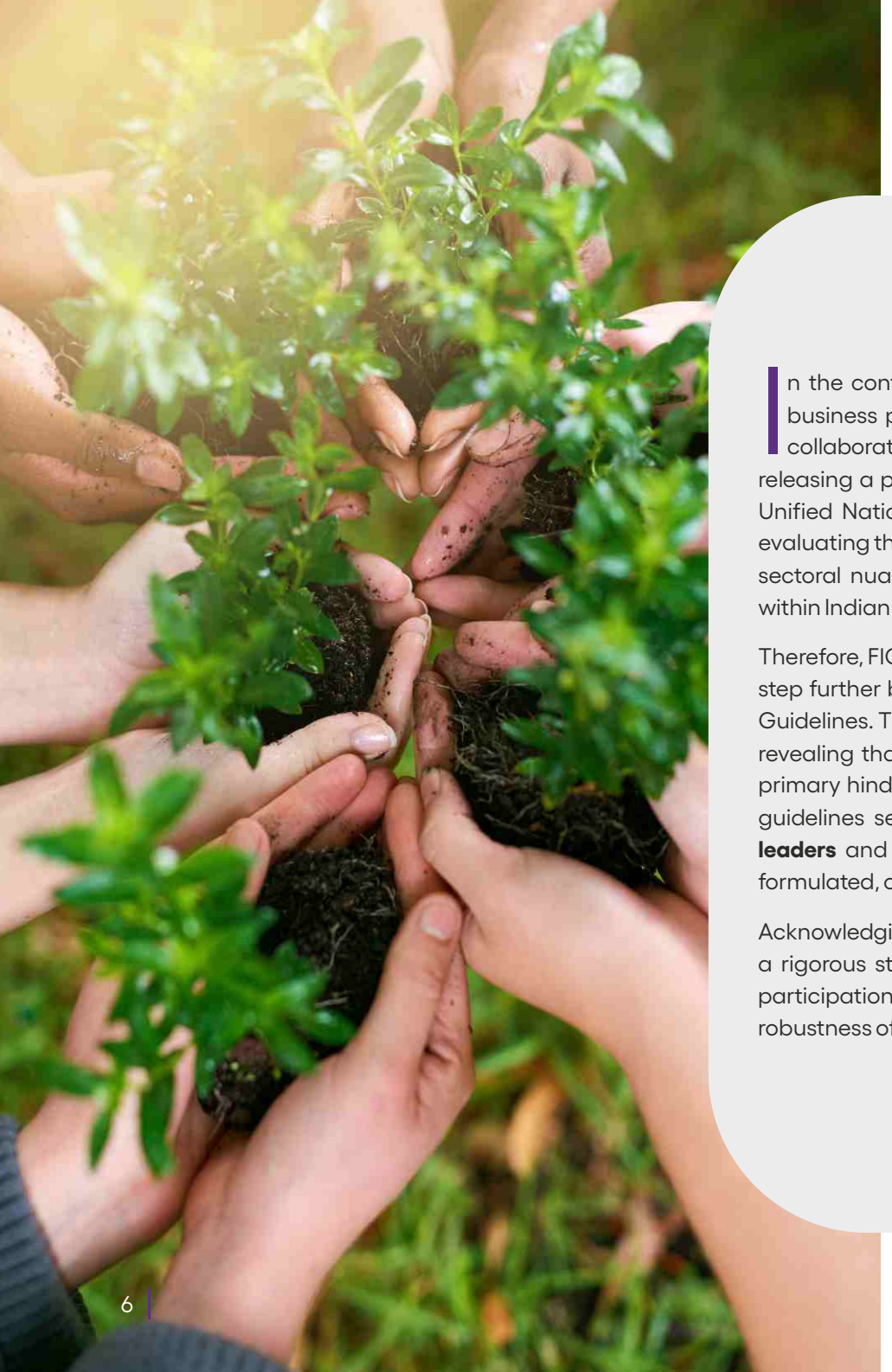
FICCI, in collaboration with European Union-Resource Efficiency Initiative (EU-REI) & Accenture as technical partner, is happy to present **"Unified National Circular Economy Measurement Framework-Sectoral Guidelines"** for Auto components & FMCG.

The sector specific Circular Economy Measurement Implementation playbook, developed under the project, will provide a valuable resource for industry practitioners to measure circularity efficiently. It offers essential insights and guidelines, laying the foundation for introducing and implementing circular economy measurement in India.

The Implementation playbook is a call to action. It exemplifies the collaborative spirit of industry, government, and academia working together to forge a path toward a more sustainable and resilient future. The insights within this implementation playbook will act as a roadmap for businesses, empowering them not only to endure but to flourish in the era of circular economy practices.

We hope FICCI industry members will find this framework useful for implementation.

Shailesh K. Pathak



Background

In the context of the burgeoning circular economy in India, where sustainability and responsible business practices are gaining prominence, **FICCI and Accenture, with support from NITI Aayog**, collaborated last year to create design principles for measuring the circular economy, subsequently releasing a position paper titled **Approaches for Measuring India's Circular Transition**. We curated a Unified National Circular Economy Measurement Framework aimed to guide Indian businesses in evaluating their circular economy performance. One of our key design principles was to deep dive onto sectoral nuances to **bridge the gap between theoretical understanding and practical application** within Indian industries.

Therefore, FICCI in partnership with Accenture Strategy and support from EU REI and NITI Aayog, took a step further by developing the Unified National Circular Economy Measurement Framework-Sectoral Guidelines. The impetus behind this initiative also stems from a survey conducted by Accenture-FICCI, revealing that **65% of surveyed corporations identified the lack of industry-specific guidelines** as a primary hindrance to effectively measure their circular economy performance. These sector-specific guidelines serve as a culmination of extensive research, incorporating insights from **50+ industry leaders** and delving into **35+ circular Key Performance Indicators (KPIs)**. Each KPI is meticulously formulated, considering sector-specific nuances and the primary materials of interest.

Acknowledging the critical importance of real-world application, the developed playbooks underwent a rigorous stress-testing phase, actively involving industry giants such as **ITC and Mahindra**. Their participation not only validated the methodology but significantly contributed to enhancing the robustness of the guidelines outlined in this playbook.

Introduction

> Within the broader sustainability landscape, the circular economy embodies a shift driven not only by environmental considerations but also by the industry's trend towards resilient, closed-loop systems, while unlocking significant value and enabling additional revenue streams
>
> *- Amit Sinha*
> *Co-Chair (Circular Economy), FICCI Environment and Climate Change Committee & MD and CEO Mahindra Lifespace Developers Ltd*

> Engaging with the circular economy reflects a universal commitment to sustainable practices that transcends industry boundaries. It's a philosophy of responsible resource management and enduring value creation, adaptable and relevant across diverse sectors, shaping a resilient and responsible future.
>
> *- Dr, Naresh Tyagi*
> *Co- Lead, FICCI Circular Economy Sub Committee and Chief Sustainability Officer, Aditya Birla Fashion and Retail Ltd*

Introduction

Circularity has gained significant attention in recent years as businesses recognize the urgent need for more sustainable practices. In contrast to the traditional linear economy of take-make-waste, circularity presents a transformative approach that aims to minimize resource consumption, waste generation, and environmental impact.

Implementing circular practices in business requires a shift in mindset and a commitment to systemic change. It requires companies to assess entire lifecycle of their products/priority products, from design and sourcing to manufacturing, distribution, and end-of-life management.

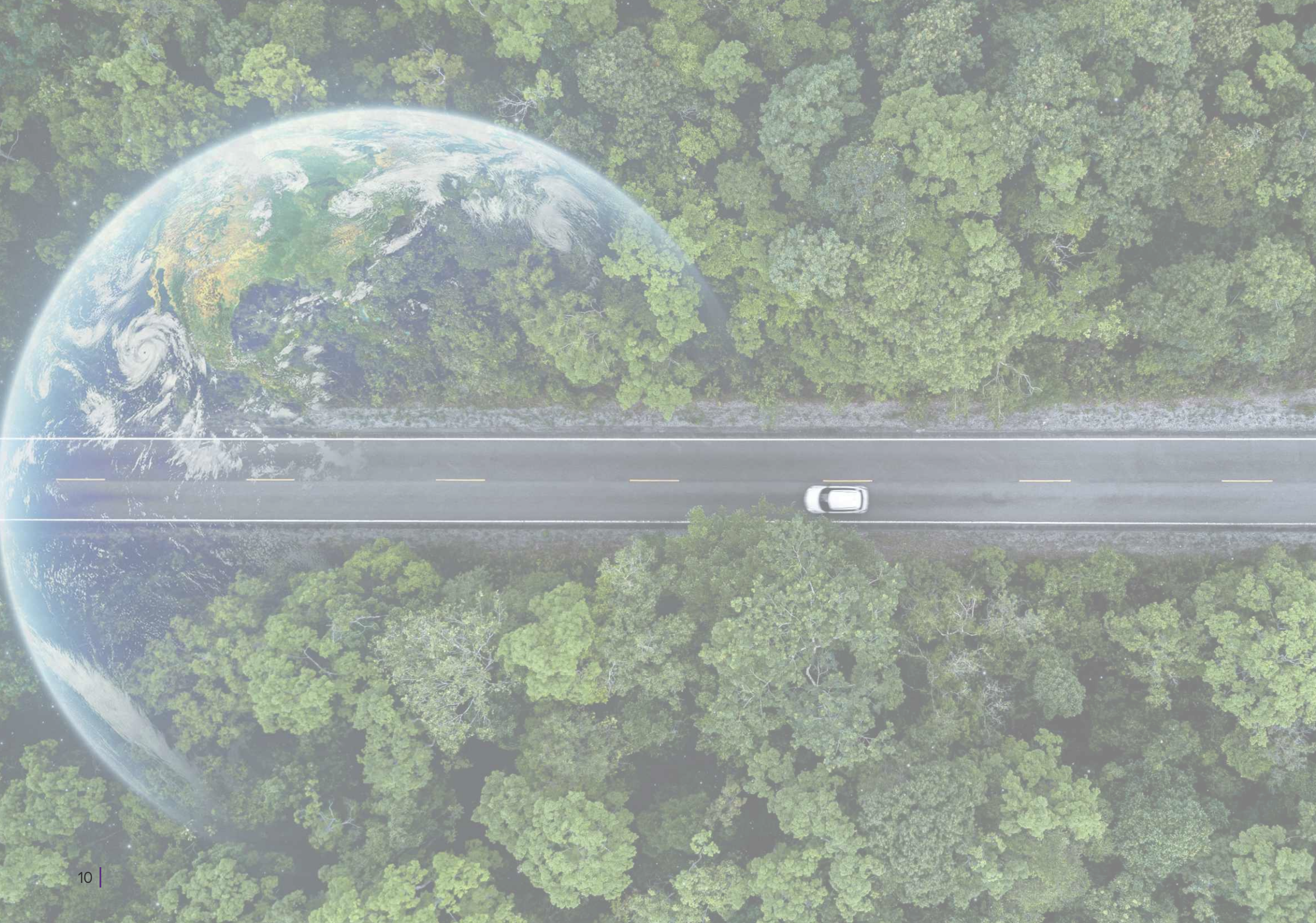
The case for action could not be clearer. But what is unclear is: **1. What** areas should company work on to be more circular? **2. How** can company measure their circularity performance? **3. Where** will the data come from?

These are the questions we have tried to answer for FMCG and Automotive sectors to begin with, through our elaborated research and deliberations with industry leaders.

As FICCI, Accenture and EU REI, we are proud to present these sector specific circularity measurement playbooks—a culmination of rigorous research, insightful analysis, and expert collaboration. These playbooks, tailored for Indian FMCG and Automotive firms, provide a comprehensive framework encompassing circularity measurement Key Performance Indicators (KPIs) and pragmatic guidelines to implement and start measuring circularity. We believe this playbook will serve as a catalyst for the sectors to not just embrace circularity, but to lead it, fostering a future where growth is not just profitable, but also sustainable, responsible, and inclusive.

CE Measurement Framework Playbook

Automotive Sector

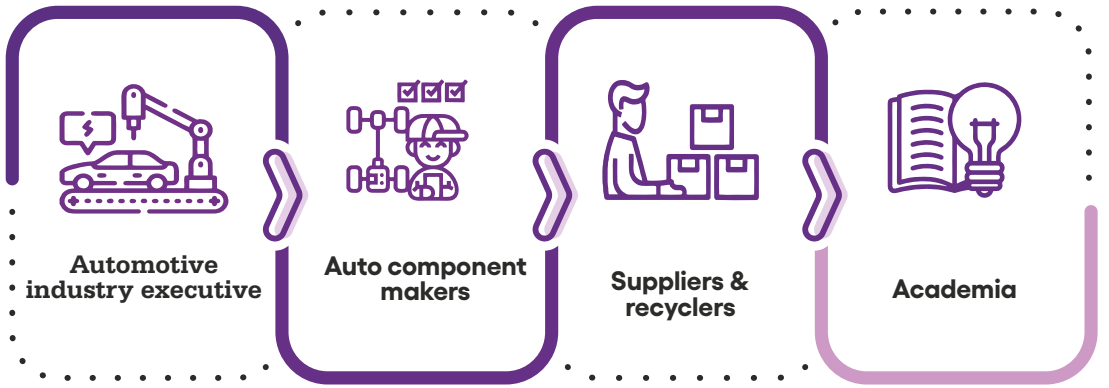


It is a step-by-step guidebook.

It will help businesses to measure **circularity** across key areas, understand their circular baseline and identify areas where they should focus upon to move towards circularity.

Based on Accenture analysis across the automotive industry and insights from workshops with the industry leaders, we have selected 22 KPIs relevant to the automotive industry. In each KPI, we have set out clear definitions and formulae, along with other necessary details to accelerate measurement of circularity in the automotive business.

The playbook is designed to cater to various stakeholders in automotive industry's value chain.

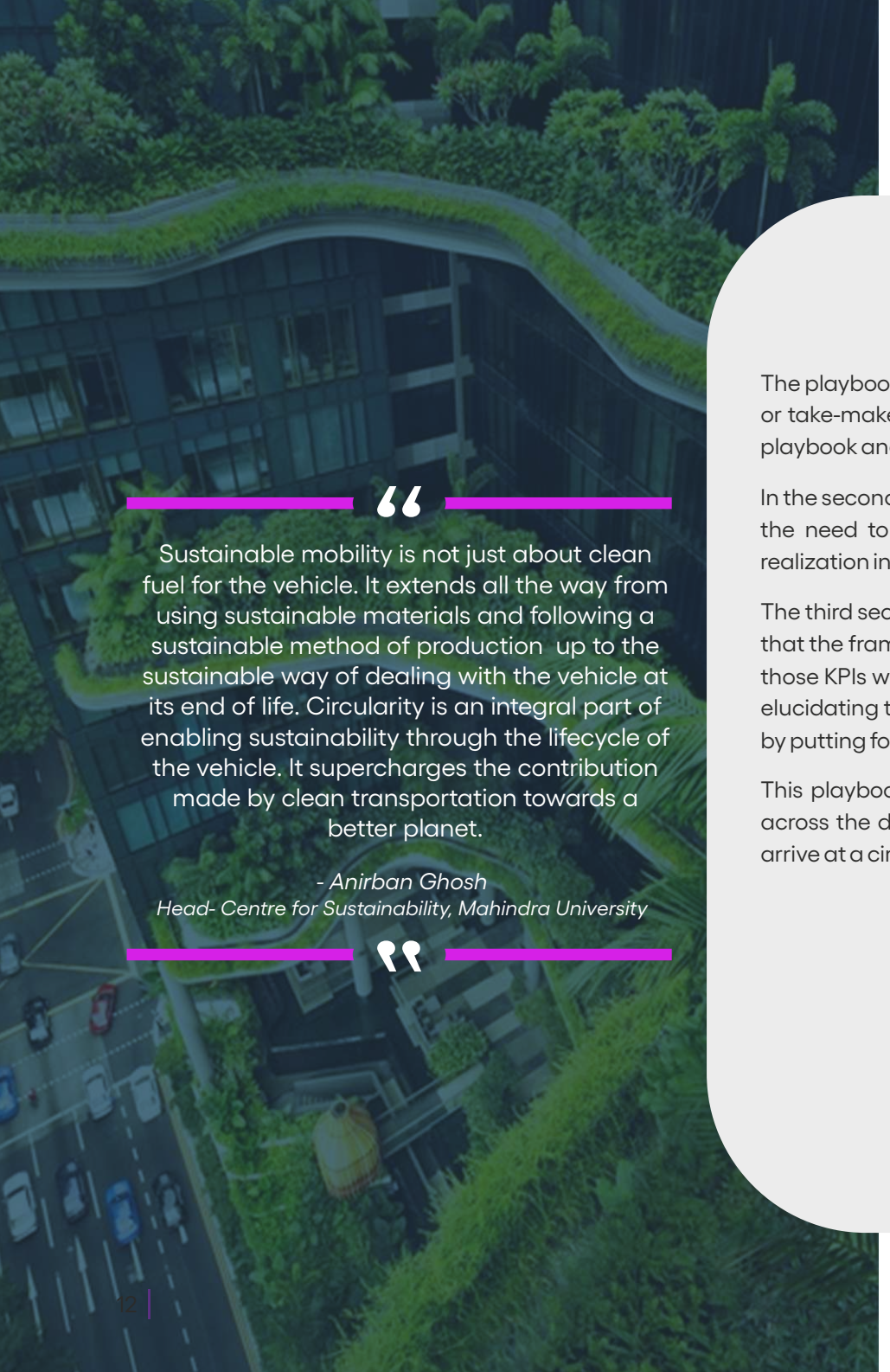


This playbook is a self assessment tool which provides automotive industry executives with:

1. **Circularity Measurement framework**
2. **22 KPIs across 4 categories**
3. **Definitions, formulae and other details for each KPI**
4. **Methodology & guidelines to calculate key circular KPIs**

What this playbook is not:

This playbook is NOT a mandatory reporting disclosure, or ESG standard for mandatory reporting or a guide to support existing ESG standards



> Sustainable mobility is not just about clean fuel for the vehicle. It extends all the way from using sustainable materials and following a sustainable method of production up to the sustainable way of dealing with the vehicle at its end of life. Circularity is an integral part of enabling sustainability through the lifecycle of the vehicle. It supercharges the contribution made by clean transportation towards a better planet.
>
> *- Anirban Ghosh*
> *Head- Centre for Sustainability, Mahindra University*

How to use this playbook

Circularity in Automotive Sector| Framework, KPIs | Way ahead

The playbook starts with an **overview** of the significant and urgent need to shift from a linear economy or take-make-waste model to a circular system. The current section also explains the purpose of this playbook and how it can be put to use by the automotive industry to measure circularity.

In the second section, it deep dives into **circularity in the automotive sector.** In addition to emphasizing the need to adopt circular initiatives in an automotive company, it captures the potential value realization in the picture.

The third section details out the **CE measurement framework** and the design principles used to ensure that the framework caters to the needs of Indian businesses . Henceforth, the playbook proposes only those KPIs which are relevant to the automotive industry. It **demonstrates each KPI** at a granular level; elucidating the definitions, formulae, inclusions and other necessary details. The playbook concludes by putting forward the **way ahead** for the circularity measurement framework.

This playbook is intended as a companion and guide for companies to self-assess their circularity across the defined KPIs. We encourage you to use this for your reference to measure each KPI and arrive at a circularity scorecard for your organization.

This playbook can be (but doesn't need to be) read sequentially

Circularity is vital to Automotive's sustainable transformation

For the past 125 years, the Automotive Industry has functioned within a 'Linear Economy' – a model wherein the materials are extracted, used and disposed at the end-of-life which has led to 7-8 million tons of waste generation annually in the form of end-of-life vehicles today.[2] Therefore, the adoption of 'Circular Economy' model that can help reduce lifecycle carbon emissions by up to 75% and non-circular resource consumption by up to 80% per passenger km by 2030, has become crucial for waste management.[1]

7-8 million tons of waste

is contributed by end-of-life vehicles, globally, every year

Circularity is now a mainstream business function, owing to significant push from stakeholders across the Automobile value chain...

The evident effects of environmental degradation due to impact of automobile sector and the emerging pressure from consumers, regulators and competitors is forcing automobile players to integrate circular approaches in their business model.

Environment degradation

In 2020, passenger cars produced approximately **three billion tons** of carbon dioxide emissions worldwide.[4]

According to the WHO, the automotive industry is responsible for about **20% of global CO emissions and 15% of NOx emissions**

Consumer pressure

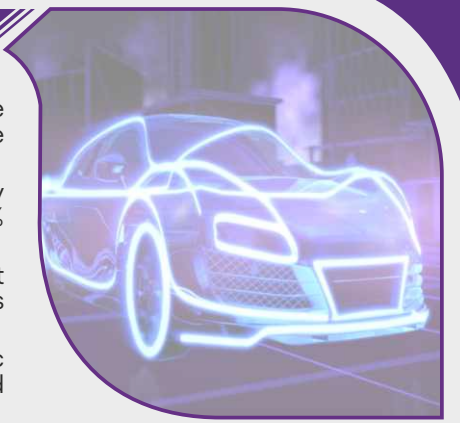
The used car segment in India has been increasing at 15% CAGR of in the last five years[3]

In an Accenture Study of 8,500 consumers globally, 64% of respondents were identified as "sustainability minded drivers" and most consumers preferred "new- energy vehicles"[8]

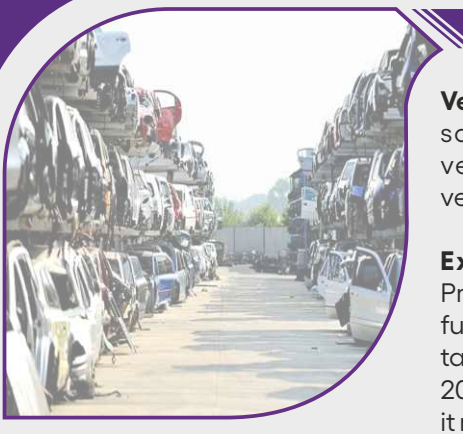
Competitive pressure

Large Automotive brands are committed to provide sustainable solutions to consumers

- Increase the share of secondary raw materials in its car fleet by 40% by 2030[5]
- Sustainable Material Target of at least 50% by 2030 for all of its vehicles[6]
- By 2030, 20% of all vehicle plastic parts will be made from recycled plastics[7]



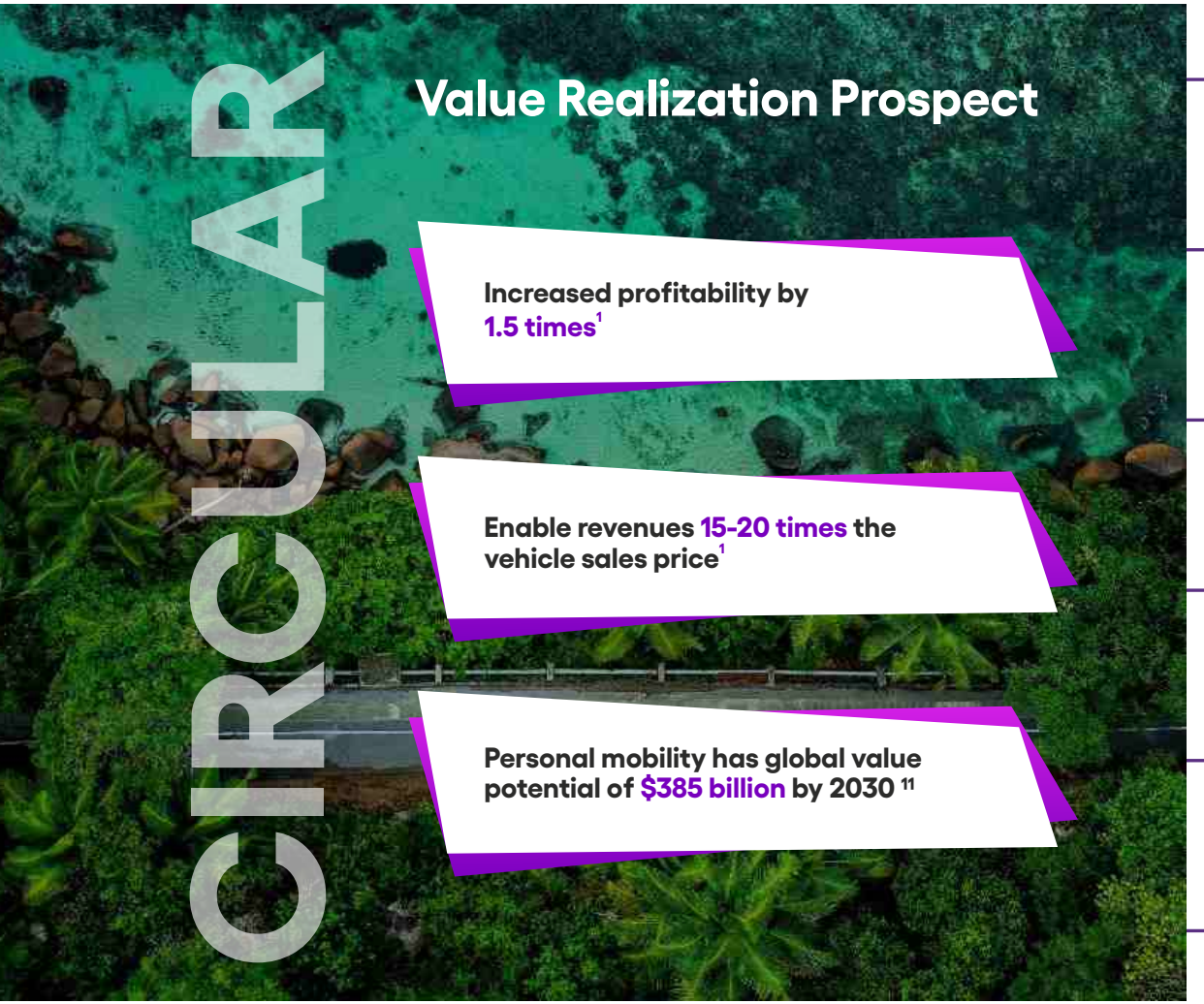
Regulatory pressure



Vehicle Scrappage in India: Mandate scrapping old & unfit commercial vehicles above 15 years/ domestic vehicles above 20 years[9]

Extended Producer Responsibility: Producers of new tyres are required to fulfill EPR for waste tyres in India. The targets start at **35%** of the weight in 2020-2021 and increase every year until it reaches **100%** in 2024-2025[10]

By embracing circular economy principles, a company can leverage its upsides and advancements...



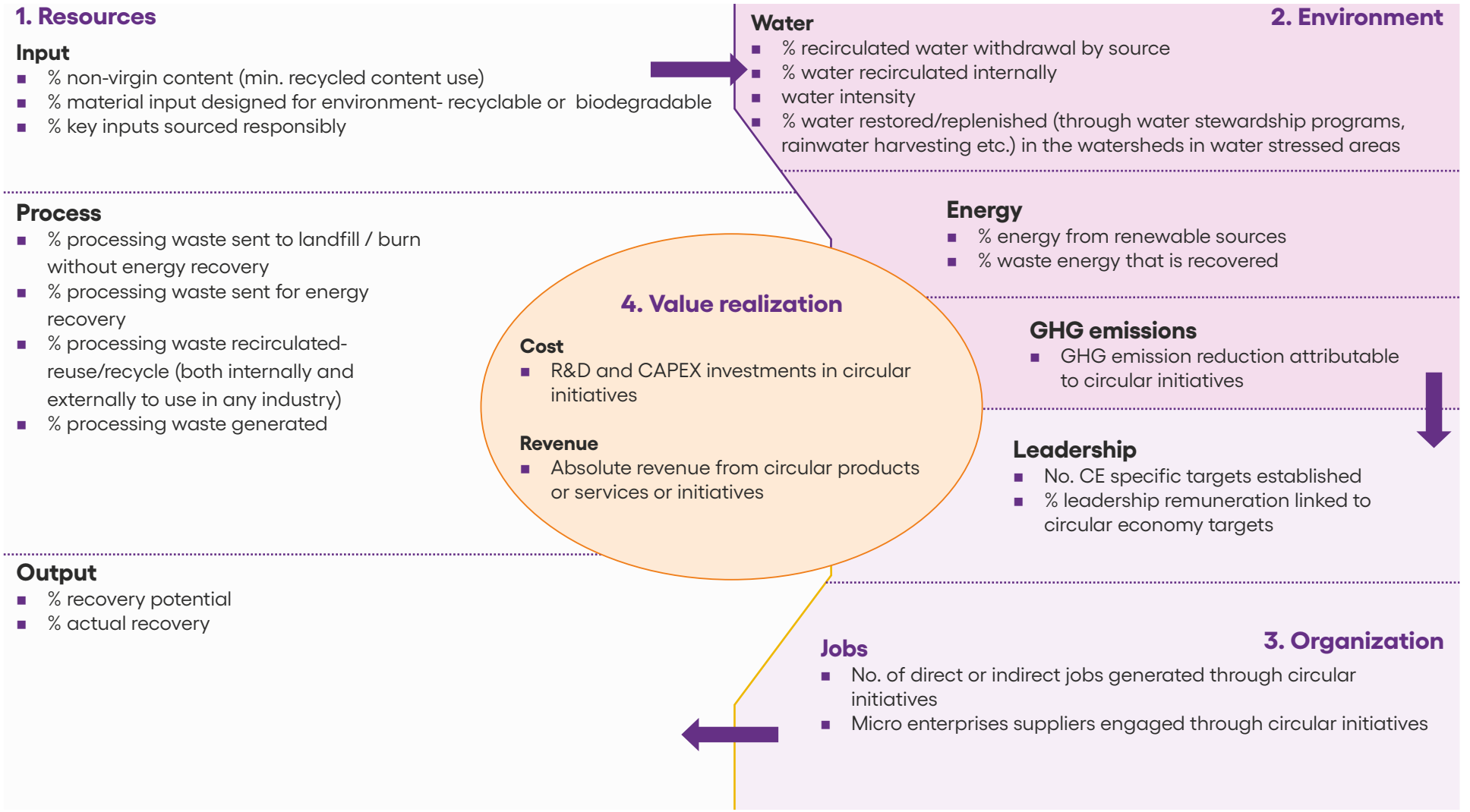
Circularity in automotive sector will lead to...

- Positive impact on the **environment** & **resource utilization**
- **Save money** on raw materials, transportation, and disposal costs
- Improves **energy efficiency** by reusing/refurbishing used components than producing new auto-parts
- Creation of **new jobs** as well as **business opportunities**
- Aids to **comply with environmental regulations** & policies
- Enhances a **company's brand image** & boosts customer loyalty

Deep dive into the 22 KPIs of the Automotive sector

- CE Measurement Framework with 22 KPIs
- What is the definition and formula for each KPI?
- What are the KPI's key materials of interest?
- How to source data for each KPI's formula?
- Additional information for better understanding

CE Measurement Framework



Level 2 KPI

How to read KPI slides

KPI name

Definition of the KPI

Material of Interest	Formula
Material 1	
Material 2	

Critical Non- critical

Any **highlights** in the formula would link to glossary for well explained definitions for users/company executives to comprehend and measure the KPI effectively.

CATEGORY/KPI PILLAR

How can you source data for the above formulas?

This section would provide details on which teams to collaborate with, what ERP systems and digital systems to leverage to source and gather the relevant data to measure the KPI

Industry example

This section would provide an example of industry leader measuring and reporting the KPI. For few cases, the example might not be the exact KPI measure but an alignment to the KPI or an initiative towards that KPI

Guidelines for Calculation

This section would talk about the boundary and scope for the KPI calculation.

Also, mention any important aspects to look through from the glossary

Supporting ESG reporting standards

This section would help company executives to understand how the KPI supports the existing ESG reporting standards and how they can leverage the playbook to also ensure compliance with other standards and manage their reputational/financial risks.

INPUT

% Non-virgin content (min. recycled content use)

Total weight of **non-virgin/recycled materials** input into the value chain over the base of total weight of non-reusable material input

Material of Interest	Formula
Plastic	$\frac{\text{(Total weight of } \textbf{non virgin/recycled} \text{ plastic input)}}{\text{(Total weight of plastic input)}} * 100\%$
Aluminum	$\frac{\text{(Total weight of non virgin/recycled aluminum input)}}{\text{(Total weight of aluminum input)}} * 100\%$
Steel	$\frac{\text{(Total weight of non virgin/recycled steel input)}}{\text{(Total weight of steel input)}} * 100\%$
Battery Materials	$\frac{\text{(Total weight of battery materials with non virgin/recycled content in input)}}{\text{(Total weight of input battery materials)}} * 100\%$
Tyres	$\frac{\text{(Total no. of tyres with non–virgin/recycled content)}}{\text{(Total no. of tyres input)}} * 100\%$
Overall	$\frac{\text{(Total weight of non virgin/recycled content used as input in packaging)}}{\text{(Total weight of overall input)}} * 100\%$

How can you source data for the above formulas?

- For Plastic, Aluminum and Steel, if:
  - ***the auto component is manufactured:*** Collaborate with the R&D/design & engineering team to gather data
  - ***the auto component is procured:*** Collaborate with the suppliers to gather data
- For Tyres and Batteries, collaborate with suppliers to understand the recycled content in the input.

Industry example

Volvo has committed to become a **fully circular business** by 2040 and is aiming to have share of 25% recycled/bio-based plastics, 40% recycled aluminum and 25% recycled steel in their products by 2025. [12]

Guidelines for Calculation

- Include **all types of plastics** listed in Glossary for calculations.
- Include **all types of battery** listed in Glossary for calculations
- All input must be calculated for finished goods manufactured
- All input must be calculated for the organization's primary products

Supporting ESG reporting standards

- **GRI Disclosure 301-2** mandates firms to report % of recycled input materials used to manufacture organization's primary products [13]
- **SEBI's BRSR** directs firms to disclose the % of recycled or reused input material to total material used [14]
- **ESRS E5-4** mandates the disclosure of the weight in both absolute value and percentage, of reused or recycled input materials used to package the undertaking's products [15]
- **WBCSD's CTI V4.0 Framework** incorporates the weight of non-virgin inflow into calculating % circular inflow [16]
- For automobile sector, **Battery EPR in India** mandate the minimum use of % of recycled content as follows[17]

Battery Type	2024-25	2025-26	2026-27	From 2027-28
Automotive	35%	35%	40%	40%
	2027-28	2028-29	2029-30	From 2030-31
Electric Vehicle	5%	10%	15%	20%

INPUT

% Material input designed for environment

% input designed for environment – i.e, designed under aspects such as **reusability, repairability, remanufacture, refurbish, recyclability, compostable, bio-degradable** or **bio-based**

Material of Interest	Formula
Plastic	$\frac{\text{(Total weight of plastic material input that is designed for enviornment)}}{\text{(Total weight of plastic material input)}} * 100\%$
Tyres	$\frac{\text{(Total weight of tyre material input that is designed for enviornment)}}{\text{(Total rubber in tyre material input)}} * 100\%$
Battery Materials	$\frac{\text{(Total weight of battery material input that is designed for enviornment)}}{\text{(Total weight of battery material input)}} * 100\%$
Overall	$\frac{\text{(Total weight of input material that is designed for enviornment)}}{\text{(Total weight of material input)}} * 100\%$

How can you source data for the above formulas?

- For Plastic/Tyres/Battery Materials, if:
  1. **The auto component is manufactured in-house:** Collaborate with the R&D/design & engineering and product teams to gather data
  2. **The auto component is procured:** Collaborate with the suppliers to understand if the input material is recyclable, biodegradable or compostable.

Industry example

Ford Motor integrated recyclable material inputs into their automobiles when they replaced traditional petroleum-based foam with **soybean-oil based foam** in their seat cushion. This move not only introduced environment friendly material into vehicle production process but also enhanced the recyclability of their end-of-life vehicles [18]

Guidelines for Calculation

- Include **all types of plastics** listed in Glossary for calculations.
- Include **all types of battery** listed in Glossary for calculations
- All input must be calculated for finished goods manufactured
- All input must be calculated for the organization's primary products
- Include these aspects of design for environment – reusability, repairability, remanufacture, refurbish, recyclability, compostable, biodegradable or biobased

Supporting ESG reporting standards

- Under **GRI 301-1**, organizations are mandated to disclose the total weight of renewable materials used to produce and package the organization's primary products during the reporting period [13]
- **ESRS E5-5** mandates the disclosure of the total weight and percentage of material in undertaking's products, including packaging, that have been designed for: [15]
  - i durability
  - ii reusability;
  - iii repairability;
  - iv disassembly;
  - v remanufacturing or refurbishment;
  - vi recycling; and
  - vii other potential optimization of product and material use

PROCESS

% Processing waste generated

Total processing waste generated as a percentage of overall production

Material of Interest	Formula
Total waste	$\frac{\text{(Total processing waste generated)}}{\text{(Total gross weight of products manufactured)}} * 100\%$

How can you source data for the above formulas?

- Collaborate with the **internal teams (factories/manufacturing units)** to understand how the processing waste is being managed and the data around it.
- The data can systematically also be fetched through ERP systems via POs and invoices for various disposal activities
- Total gross weight/product equivalent of finished goods manufactured, or total revenue can be fetched systematically from the ERP systems.

Industry example

Honda Motors generated 1,360 tons of **processing waste** in FY 2021. This includes industrial waste, general administrative waste, valuable resource emissions. [22]

Guidelines for Calculation

- Include all solid waste generated in production process across company's own factories/sites
- Exclude waste generated for production at contract manufacturers/third parties
- Exclude effluent waste
- It is recommended to also track absolute numerator values
- The KPI can be measured as a base of gross weight or product equivalent of finished goods manufactured or total revenue for the reporting period

Supporting ESG reporting standards

- **GRI Disclosure 306-3** mandates firms to report total weight of waste generated in metric tons and a breakdown of this total by composition of the waste [20]
- **SEBI's BRSR** directs firms to disclose the amount of total waste generated (in metric tons) in current & previous fiscal year [14]
- Similarly, **ESRS E5-6-41** also mandates the same disclosure as BRSR [15]
- The KPI is line with **Hazardous and Other Wastes (Management and Transboundary Movement Rules) 2016** which mandates waste generators to report the quantity of waste generated in-house [10]

PROCESS

% Processing waste sent to landfill / incinerated without energy recovery

Total processing waste sent to **landfill/ incinerated without energy recovery** over the base of total processing waste generated

Material of Interest	Formula
Hazardous waste	$\frac{\text{(Total processing } \textbf{hazardous waste} \text{ sent to landfill or incinerated without ER)}}{\text{(Total processing hazardous waste generated)}} * 100\%$
Total waste	$\frac{\text{(Total processing waste sent to landfill or incinerated without ER)}}{\text{(Total processing waste generated)}} * 100\%$

How can you source data for the above formulas?

- Collaborate with the **internal teams (factories/manufacturing units)** to understand how the processing waste is being managed and the data around it.
- The data can systematically also be fetched through ERP systems via POs and invoices for various disposal activities.

Industry example

In FY 2022, Hyundai sent 7,164 tons of waste to **landfill** and 29,524 tons of waste to **incineration (not recovered as thermal energy)** accounting for 6.68% of total waste generated.[19]

Guidelines for Calculation

- Include all waste generated across company's own factories/sites
- Exclude waste generated for production at contract manufacturers/third parties
- Exclude effluents
- Include **all types of hazardous waste** listed in Glossary for calculations

Supporting ESG reporting standards

- **GRI Disclosure 306-5** mandates firms to report total weight of waste directed to disposal in metric tons and a breakdown of both hazardous and non-hazardous waste across landfills, incinerated with and without energy recovery [20]
- **SEBI's BRSR** directs firms to report, for each category of waste generated, total waste disposed by nature of disposal method – landfilling, incineration and other disposal operation [14]
- Similarly, **ESRS E5-6-41** also mandates the same disclosure as BRSR [15]

PROCESS

% Processing waste sent for energy recovery

Total **processing waste** sent for energy recovery **(incineration with energy recovery/ energy recovery from combustion)** over the base of total processing waste generated

Material of Interest	Formula
Hazardous waste	$\frac{\text{(Processing hazardous waste sent for energy recovery)}}{\text{(Total processing hazardous waste generated)}} * 100\%$
Total waste	$\frac{\text{(Total processing waste sent for energy recovery)}}{\text{(Total processing waste generated)}} * 100\%$

How can you source data for the above formulas?

- Collaborate with the **internal teams (factories/manufacturing units)** to understand how the processing waste is being managed and the data around it.
- The data can systematically also be fetched through ERP systems via POs and invoices for various disposal activities.

Industry example

In FY 2022, Hyundai **incinerated (with recovery as thermal energy)** almost 5,451 tons of processing waste. This accounts for almost 1% of total weight of waste generated. [19]

Guidelines for Calculation

- Include processing waste disposed through incineration with energy recovery or other energy recovery facilities
- Only energy recovery from combustion should be included
- Include all waste generated in the production process across company's own factories/sites
- Exclude waste generated for production at contract manufacturers/third parties
- Include all types of hazardous waste listed in Glossary

Supporting ESG reporting standards

- **GRI Disclosure 306-5** mandates firms to report total weight of waste directed to disposal in metric tons and a breakdown of both hazardous and non-hazardous waste across landfills, incinerated with and without energy recovery [20]
- It also aligns with **BRSR's** disclosure requirement for each category of waste generated, total waste disposed by nature of disposal method (in MT): [14]
  - i Incineration
  - ii Landfilling
  - iii Other disposal operations
- Similarly, **ESRS E5-6-41** also mandates the same disclosure as BRSR [15]

PROCESS

% Processing waste recirculated (both internal/external)

Total **processing waste** recirculated- **reused, recycled, upcycled** both internally (within the organization) or externally (outside the organization) over the base of total processing waste generated

Material of Interest	Formula
Hazardous waste	$\frac{\text{(Total processing hazardous waste recycled, reused, upcycled internally or externally)}}{\text{(Total processing hazardous waste generated)}} * 100\%$
Overall	$\frac{\text{(Total processing waste recycled, reused, upcycled internally or externally)}}{\text{(Total processing waste generated)}} * 100\%$
Aluminum	$\frac{\text{(Total processing Al waste (in kg/ton) recycled, reused, upcycled internally or externally)}}{\text{(Total processing Al waste (in kg/ton) generated)}} * 100\%$
Steel	$\frac{\text{(Total processing steel waste (in kg/ton) recycled, reused, upcycled internally or externally)}}{\text{(Total processing steel waste (in kg/ton) generated)}} * 100\%$
Plastic	$\frac{\text{(Total processing plastic waste (in kg/ton) recycled, reused, upcycled internally or externally)}}{\text{(Total processing plastic waste (in kg/ton) generated)}} * 100\%$

How can you source data for the above formulas?

- Collaborate with the **internal teams (factories/manufacturing units)** to understand how the processing waste is being managed and the data around it.
- The data can systematically also be fetched through ERP systems via POs and invoices for various disposal activities.

Industry example

General Motors defines operational waste as "all relevant streams (>98% of reported operational waste) that are not generated due to construction, demolition or remediation. GM has achieved a waste diversion rate of 91.8% by diverting 1.33 million metric tons of waste from landfills, incinerators & energy recovery facilities. [21]

Guidelines for Calculation

- Include all waste generated in production process across company's own factories/sites. Exclude effluents.
- Exclude waste generated for production at contract manufacturers/third parties
- There might be cases, when the process waste is reused internally and the data is not logged either manually or systematically under waste. Those cases can be excluded from the calculation.

Supporting ESG reporting standards

- **GRI Disclosure 306-4** mandates firms to report total weight of waste diverted from disposal in metric tons and a breakdown of both hazardous and non-hazardous waste diverted into preparation for reuse, recycling and other recovery operations [20]
- **ESRS E5-5-25** also mandates disclosure of additional information on the weight and percentage of products and materials that come out of the undertaking including packaging that are recirculated in practice after their first use [15]
- The KPI is line with **Hazardous and Other Wastes (Management and Transboundary Movement Rules) 2016** which mandates waste generators to report the quantity of waste utilized in-house. [10]

OUTPUT

% Recovery potential

Percentage of product/vehicle portfolio that is technically possible to **recycle, reuse, refurbish, remanufacture**

Material of Interest	Formula
Overall products	$\frac{\text{(Total number of vehicles in portfolio that are technically possible to recover)}}{\text{(Total number of vehicles in a portfolio)}} * 100\%$

% Actual Recovery (Aspirational KPI)

Total material recovered after reaching end-of-life over the base of total material input in vehicles sold

Material of Interest	Formula
Overall products	$\frac{\text{(Total material recovered from products or vehicles after reaching end of life cycle)}}{\text{(Total weight of material in the products/vehicles sold)}} * 100\%$

A. RESOURCES

How can you source data for the above formulas?

- Collaborate with R&D, design & engineering, packaging and ESG teams to calculate the number of products/vehicles that can be technically recovered after end-of-life use
- Actual recovery data seems **aspirational** as per current ecosystem, but with the battery, tyre and end of life vehicle EPRs coming in, this data should be available through PROs and recycling certificates

Industry example

Hyundai vehicles are 85% recyclable, and the **recoverability rate** is 95% (including recovery of thermal energy from waste disposal) [19]

Guidelines for Calculation

- All input must be calculated for finished goods manufactured and organization's primary products
- Measure the KPI with and without energy recovery
- Actual recovery KPI is an 'Aspirational KPI' for now as the ecosystem to measure this KPI isn't mature enough from Indian context. With end-of-life vehicles regulations/EPRs taking shape, the ecosystem should evolve for Auto sector.

Supporting ESG reporting standards

- Under **GRI 301-3,** organizations need to disclose % of reclaimed products for each product category [13]
- **WBCSD's CTI V4.0 Framework** provides a metric that is in line with this KPI - % Recovery potential [16]
- For automobile sector, the **Battery and Tyre EPRs in India** (as shown below) mandate the following % of recycling target in weight (tons) [10, 17]

Comp. Year	2023-24	2024-25	FY 25 – 35
Target	50%	70%	90%
Base Year	2020-21	2021-22	FY 22-32

Comp. Year	2023-24	2024-25	2025-26	From FY26
Target	50%	60%	70%	70%
Base Year	2018-19	2019-20	2020-21	From FY22

- According to **a proposal** presented by MoEFCC on **end-of-life vehicle management EPR,** manufacturers will be responsible for recycling/recovering a share of vehicles they put on the market [23]

WATER

% Recirculated water withdrawal

% water sourced/withdrawal from **recirculated sources** as a proportion of total **water withdrawal**

Material of Interest	Formula
Overall	$\frac{\text{(Qty of water source/withdrawal from recirculated sources)}}{\text{(Qty of total water withdrawl)}} * 100\%$

How can you source data for the above formulas?

Collaborate with utilities, environment and ESG teams to gather the data, systematically through:

- **Invoices/bills** with quantity of treated water procured from third party sources, municipal wastewater treatment plants
- **Water meter records and calculations based on water audit:** Meter logbooks and water balance plan detailing the quantity of treated water and quantity of total water withdrawal
- **SAP/ERP:** records to fetch qty of total water withdrawal/sourced.

Industry example

Mercedes-Benz collaborates with municipal waste-water disposal authorities to purify waste-water from biological treatment plants and use them for operations. For instance, a third of the freshwater consumption at Sindelfingen had been set to be replaced with treated waste-water from a nearby sewage treatment plant from May 2023. [24]

Guidelines for Calculation

- Include the recycled treated water procured and used in operations (including cooling, cleaning, dust suppression, irrigation, sanitary usage, etc.)
- Include procurement of recycled treated water from municipal water suppliers, municipal wastewater treatment plants, public or private utilities, and other organizations involved in the provision, transport, treatment of tertiary treated recycled water.

Supporting ESG reporting standards

- **GRI Disclosure 303-3** directs firms to report water withdrawal by source [25]
- **WBCSD's CTI V4.0 Framework** directs firms to track through % circular water inflow which aligns with the stipulated KPI. CTI also mandates that the volume, quality and sources of water inflow/outflow, source vulnerability and local regulatory requirement to be reported by firms. [16]
- **Alliance for Water Stewardship Standard** mandates firms to report their sources of water withdrawal and water-management/conservation efforts [26]
- **ISO 14046:2014** mandates firms to report their water use, withdrawal from all sources and asks for detailed water-foot printing of products, processes of the organization based on LCA [27]
- **TNFD A3.2** mandates firms to disclose Water reduced, reused or recycled and **A2.0** directs to disclose wastewater treated, reused/recycled or avoided [40]

WATER

% Water recirculated internally

% **water recirculated internally** as a proportion of total **water withdrawal**

Material of Interest	Formula
Overall	$\frac{\text{(Qty of total water recirculated internally)}}{\text{(Qty of total water withdrawl)}} * 100\%$

How can you source data for the above formulas?

- Collaborate with utilities, environment and ESG teams to gather the data, systematically through:
- **Water meter records and calculations based on water audit:** Meter logbooks and water balance plan detailing the quantity of treated water and quantity of total water withdrawal
- **SAP/ERP:** records to fetch qty of total water withdrawal/sourced.

Industry example

Hyundai reused 2,284,154 tons of water in 2022 with a re-use ratio of 21% and a year-on-year increase of 5% over 2,179,600 tons of water in 2021. [19]

Guidelines for Calculation

- Include water reused/recirculated on site for purpose like flushing, landscaping, gardening, cooling, etc.
- Include the quantity treated wastewater from wastewater treatment plants, which gets utilized once again in operations of same company.
- In the absence of water meter data for each source stream to fetch water recirculation, use reasonable estimations and apportioning based on limit of STPs etc.

Supporting ESG reporting standards

- **ESRS E3 (Water and Marine Resources)** mandates firms to report the quantity of water recycled/re-used internally by the organization [28]
- **WBCSD's CTI V4.0 Framework** directs firms to track onsite water circulation (reuse and recycle) along with % circular water inflow focusing on internal facility circulation through reuse and recycling. [16]
- **ISO 14046:2014** mandates firms to report their water use, withdrawal from all sources and asks for detailed water-foot printing of products, processes of the organization based on LCA [27]
- **TNFD A3.2** mandates firms to disclose Water reduced, reused or recycled and **A2.0** directs to disclose wastewater treated, reused/recycled or avoided [40]

WATER

Water intensity

% total qty of **water withdrawal** as a proportion of total gross weight of production

Material of Interest	Formula
Overall	$\frac{\text{(Qty of water withdrawn)}}{\text{(Total gross weight of products manufactured)}} * 100\%$

How can you source data for the above formulas?

- Collaborate with utilities, environment and ESG team to gather the data, systematically through
- **ERP/water meters:** Bills/invoices and other meter records to fetch qty of water withdrawal/sourced from multiple sources.
- Total gross weight/product equivalent of finished goods manufactured, or total revenue can also be fetched systematically from the ERP systems

Industry example

Tata Motors reported a water withdrawal intensity of 6.12 cubic metres/vehicle in FY 2022-23. Additionally, the water intensity per crore rupee of turnover increased from 54.52 to 58.90 kL/crore during this period [29]

Guidelines for Calculation

- The KPI can be measured as a base of gross weight or product equivalent of finished goods manufactured or total revenue for the reporting period tment of tertiary treated recycled water.
- It is recommended to also track absolute numerator values

Supporting ESG reporting standards

- **GRI Disclosure 303-3** directs firms to report water withdrawal by source [25]
- **Alliance for Water Stewardship Standard** mandates firms to report their sources of water withdrawal and water-management/conservation efforts [26]
- **ISO 14046:2014** mandates firms to report their water use, withdrawal from all sources and asks for detailed water-foot printing of products, processes of the organization based on LCA [27]
- **TNFD A3.0** mandates disclosure of Total water consumption and withdrawal and **C3.0** mandates disclosure of Water withdrawal and consumption from areas of water scarcity [40]

WATER

% Water restored/replenished (through water stewardship programs, rainwater harvesting etc.) in the watersheds in water stressed areas

% water restored or replenished in the **watersheds** in **water stressed** areas as a proportion of total water withdrawal

Material of Interest	Formula
Overall	$\frac{\text{(Qty of total water replenished/restored in the watersheds in water stressed areas)}}{\text{(Qty of total water withdrawl)}} * 100\%$

How can you source data for the above formulas?

- Collaborate with utilities, environment, ESG teams and external hydrogeologists to gather the data.
- **ERP/water meters:** Bills/invoices and other meter records to fetch qty of water withdrawal/sourced from multiple sources.
- Estimation of water to be recharged through water harvesting programs can be done through **hydrogeology study reports of the catchment area** and stakeholder consultation reports from NGOs & local communities/farmers.

Industry example

Mahindra & Mahindra has set a target of recharging groundwater to the tune of 37,500 cubic metres per year and accordingly they built 3 rainwater harvesting pits with capacity of 7,024 cubic metres per year. Moreover, M&M harvested 154,550 Kl of rainwater at Nashik Plant alone achieving the status of a certified water positive plant in 2022. [30]

Guidelines for Calculation

- Include all water harvesting initiatives to recharge groundwater in the catchment areas where company is operating, focusing on the water stressed areas.
- If water to be conserved or recharged calculations are not available through hydrogeology studies, then refer to government district rain gauge, terrain wise estimated percolation data to estimate replenishment for the catchment.

Supporting ESG reporting standards

- **GRI Disclosure 303-1 (Interactions with water as a shared resource)** mandates firms to report water stewardship efforts made in collaboration with other stakeholders [25]
- **Alliance for Water Stewardship Standard** mandates firms to report their sources of water withdrawal and water-management/conservation efforts [26]
- **ISO 14046:2014** mandates firms to report their water use, withdrawal from all sources and asks for detailed water-foot printing of products, processes of the organization based on LCA [27]
- **TNFD A3.1** mandates disclosure of volume of water (m3) replenished to the environment through replenishment programmes (split into total & to areas of water scarcity)[40]

ENERGY

% Energy from renewable sources

Percentage of energy consumption from **renewable sources** as a proportion of total energy consumption

Material of Interest	Formula
Overall	$\frac{\text{(Qty of energy consumed from renewable sources)}}{\text{(Qty of total consumption of energy)}} * 100\%$

% Waste energy that is recovered

Percentage of energy that is recovered as a proportion of total **waste energy/gases** generated

Material of Interest	Formula
Overall	$\frac{\text{(Qty of waste energy that is recovered)}}{\text{(Qty of total waste energy/gases generated)}} * 100\%$

How can you source data for the above formulas?

Collaborate with utilities, manufacturing and operations teams to gather data

Data on quantity of renewable energy consumed can be gathered systematically:

- SCADA systems & Energy Management systems
- Renewable Energy Supplier Information
- Energy Audits

Industry example

Toyota has set out to achieve a 25 percent introduction rate for renewable electricity by 2025 outlined in their 7th Environmental Action Plan. As of 2021, they achieved a 100 percent RE introduction rate at all plants in Europe and 13% RE introduction rate globally. [31]

Guidelines for Calculation

- Renewable energy classification must follow GRI or ESRS boundaries (refer to Glossary)
- Energy consumption must be calculated at company level across usage sites.
- Include renewable energy sourced through strategic partnerships like PPAs and RECs, renewable energy bought from energy grids, on-site RE generation (solar, wind, etc.)
- It is recommended to also track & assess absolute energy consumption across the organization

Supporting ESG reporting standards

- **GRI Disclosure 302-1 (Energy Consumption within the organization)** mandates firms to report fuel consumption from renewable sources including the fuel types [32]
- **SEBI's BRSR** directs firms to report total energy consumed from renewable sources under their leadership indicators [14]
- **WBCSD's CTI V4.0 Framework** specifically mentions %renewable energy as one of the key energy indicators for firms to track & report [16]
- **ESRS E5 (Resource use and circular economy)** mandates firms to report the transitioning from non-renewable to renewable sources of energy [15]
- **ISO 50001 (Energy Management Systems)** directs firms to report the RE sources of energy along with other details from their energy purchase specifications [33]

LEADERSHIP & JOBS

Number of CE specific targets established

Number of circularity specific targets established to link leadership indicator with firm's targets

Circular Economy specific targets are of paramount importance in the automobile industry due to its potential to transform the sector's environmental impact, resource consumption, and business practices. Embracing circularity will bring forth benefits such as resource conservation, waste reduction, carbon emissions reduction, energy efficiency. Regulatory compliance and increased customer value to the industry.

% Leadership remuneration linked to circular economy targets

Percentage of leaders whose remuneration is linked to achieving circularity targets

Aligning leadership remuneration with circular economy targets will foster stronger commitment to sustainability and responsible business practices. Circular targets in executive remuneration ensure that sustainability goals are integrated into the company's strategic decision-making. This practice will improve long term focus, risk mitigation, employee engagement, operational efficiency and stakeholder confidence

Number of micro-enterprise suppliers engaged through circular initiatives

No. of micro enterprises/startups engaged in the entire value chain through circular initiatives

Collaborating with and leveraging micro-enterprise suppliers through circular initiatives is beneficial to automobile industry, promoting inclusive sustainable practices throughout the supply chain. This approach empowers local economies, fosters supply chain resilience and innovation, and strengthens social and environmental resilience enabling the organization's commitment to holistic circularity and positive societal impact.

Guidelines for Calculation

- Sustainability targets can be defined as Circular Economy/Circularity targets if they align with any of the KPIs discussed as part of this playbook
- Any initiatives aligned with the KPIs discussed as part of this playbook can be classified as circular initiatives
- To quantify micro-enterprise engagement through circular initiatives, it is recommended to also look at monetary value of these contracts vs. value of overall contracts
- Refer to Glossary for details on what would constitute as circular initiatives

Alignment with standards

- **SEBI's BRSR** mandates firms to report the circular initiatives they have organized in each fiscal year related to improving resource efficiency, water/waste/emissions/ effluent discharge management [14]
- **ESRS E5 Resource Use and Circular Economy Disclosure 5** directs firms to report the measurable outcome-oriented target set to meet the resource-use and circular economy-related policy's objectives related to the management of material impact, risk and opportunities [15]

COST & REVENUE

R&D and CAPEX investments in circular initiatives

R&D and CAPEX investments in circular initiatives in the year

Material of Interest	Formula
Overall	Total R&D and CAPEX investment amount in CE initiatives annually

Revenue from circular products or services

Revenue generated from circular products/services/initiatives in the year

Material of Interest	Formula
Overall	Total Revenue from circular products or services or initatives annually

D. VALUE REALIZATION

How can you source data for the above formulas?

- Collaborate with finance & R&D teams to identify funds invested in circularity initiatives
- Access ERP and financial system reports to identify relevant cost centers for circular initiative investment
- Collaborate with products teams to identify revenue streams aligned with circular products and services

Industry example

Kia Motors invested 100 Million Korean Won as environmental investment to address climate related challenges. [34]

Guidelines for Calculation

- Include only invested capital and not earmarked funds
- Include only realized revenue from circular products and services into consideration
- Any initiatives aligned with the KPIs discussed as part of this playbook can be classified as circular initiatives
- Refer to Glossary for details on what would constitute as circular initiatives

Alignment with ESG reporting standards

- **GRI Disclosure 201-2** (Financial Implications and other risks and opportunities due to climate change) directs firms to report the percentage of capital expenditure that is allocated to investments in ESG initiatives [35]
- **SEBI's BRSR** mandates firms to report percentage of R&D and CAPEX investments in specific technologies to improve the environmental and social impact of products & processes [14]

AMBITIOUS INDICATORS

ASPIRATIONAL

Responsible Sourcing & Traceability KPI

% key inputs sourced responsibly

It is critical that automobile firms ensure responsible sourcing practices which is essential for achieving sustainability goals and at the same time focuses on transparency & traceability. With the advent of Digital Product Passport regulations [36] in EU, sharing of key product related information that are essential for products' sustainability and circularity is becoming mandatory for automobile firms. For instance, according to the EU Battery Regulation 2023 [37], all electric vehicle batteries sold in EU from 2026 are mandated to have DPP containing key product information such as battery characteristics, performance, durability and recyclability.

No. of direct or indirect jobs generated through circular initiatives

No: of direct or indirect jobs generated through circular initiatives

This KPI highlights contribution to sustainable employment, showcases social responsibility, and reinforces their role in fostering a circular economy. Among other opportunities, recycling, reuse, and remanufacturing require highly skilled resources, and this creates newer direct employment opportunities across the auto value chain. Technology partners can help automakers by offering much-needed technical know-how and product/platform experience, thereby creating indirect employment opportunities.

GHG emission reduction attributable to circular initiatives

Total reduction in GHG emissions (across Scope 1, 2 and 3) from circular initiatives

Recognizing that circular economy initiatives inherently drive GHG emission reduction, it's imperative for Indian automobile companies to report on the total reduction in GHG emissions (across Scope 1, 2, and 3) resulting from circular initiatives. A circular automotive value chain is necessary to reduce carbon emissions by up to 75% as well as resources consumption by up to 80% per passenger kilo-metre (km) until 2030. As mandated by European Commission, from 2020 to 2024, all cars must have emissions under 95 g CO2/km, a regulatory reduction of 15 % for cars after 2025 and a 37.5% reduction from 2030 onwards. [38] Under Corporate Average Fuel Economy Standards (CAFÉ) [39] in India, average corporate CO2 emission must be less than 130 gm per km till 2022 and below 113 gm per km thereafter.

Guidelines to approach these KPIs

- Refer to Glossary for details on what would constitute as circular initiatives
- Any initiatives aligned with the KPIs discussed as part of this playbook can be classified as circular initiatives

Responsible Sourcing & Traceability KPI

- A good way to measure this will be through relevant ecolabels, consumer information tools and certifications like supplier ecolabels, Cradle to Cradle certification etc.
- Aspects like local sourcing and traceability data through credible traceability applications & systems is also critical

No. of jobs generated through CI initiatives

- Any initiatives aligned with the KPIs discussed as part of this playbook can be classified as circular initiatives
- Collaborate with the recycling/ecosystem partners, and internal circular initiatives teams such as R&D, engineering, manufacturing, logistics, waste management, and other relevant functions to understand an impact on additional job creation/formalization to support those initiatives
- It is also recommended to track the training and development of workforce in circular skills

GHG emission reduction from CI initiatives

- Leverage LCAs to measure the GHG emissions reduction with implementation of circular initiatives.
- Ensure that emissions reductions from all three scopes (Scope 1,2,3) are considered.
- Ensure accuracy and credibility by using established GHG calculation methodologies from:
  - GHG protocol
  - GRI 305: Emissions
  - European Commission Guidelines
  - IPCC Guidelines

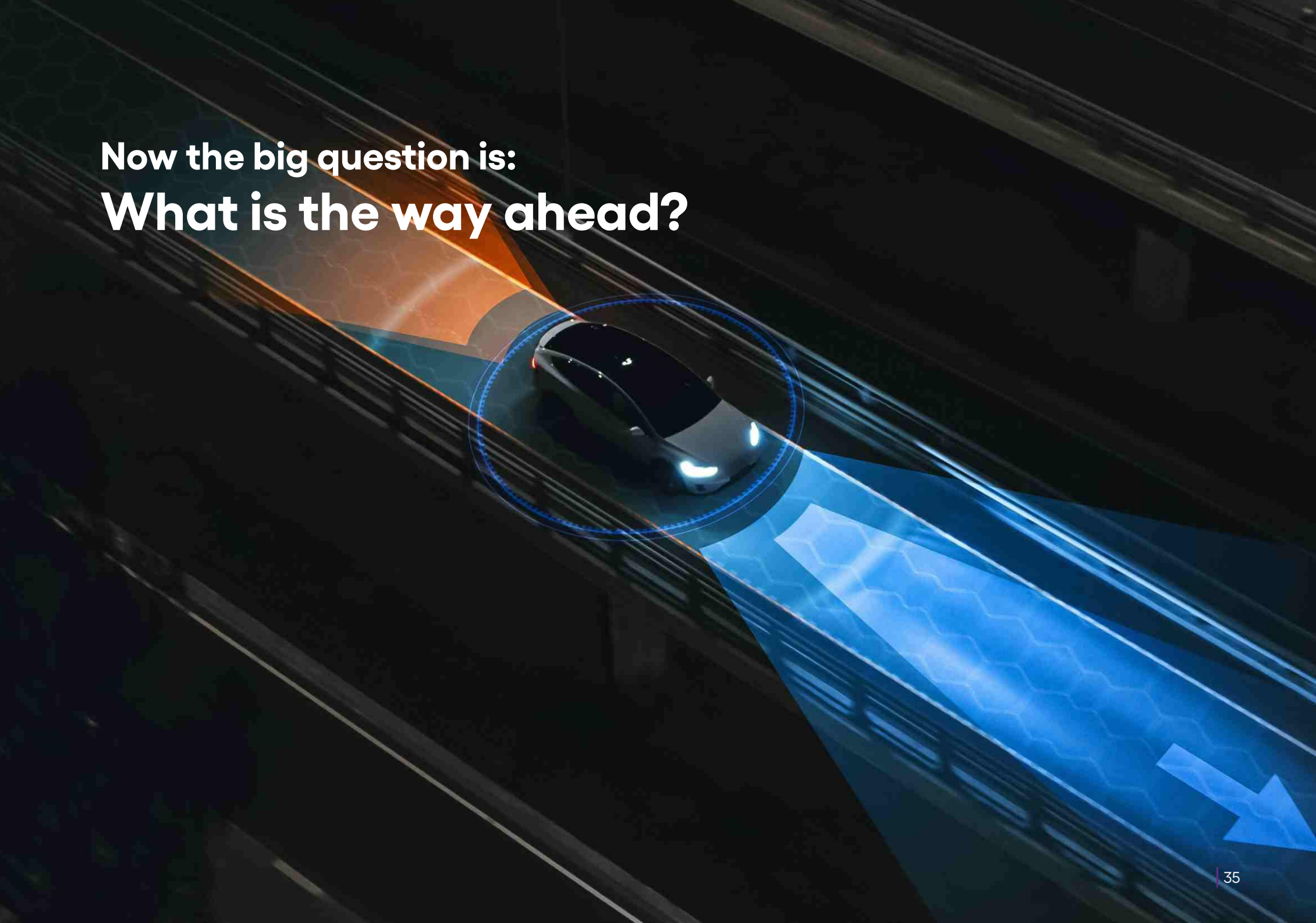
Detailed Phase 1 Scorecard- Automotive Sector

Illustrative

Level 1	Level 2	Level 3 & Level 4						(Level 4 applicable only to resources)			
Resources	Input	% non-virgin content (min. recycled content use)	20% 30% 20% 80% 30%	% material input designed for environment	50% 50% 50%	% key inputs sourced responsibly	20%				
	Process	% processing waste recirculated (both internal/external)	70% 80% 90% 20%	% processing waste sent to landfill / incinerated without energy recovery	1% 4%	% processing waste sent for energy recovery	70% 36%	% processing waste generated	1		
	Output	% recovery potential	98%	% actual recovery	85%						
Environment	Water	% recirculated water withdrawal by source	60%	% water recirculated (internal/external use)	95%	Water Intensity	1.1 L/ton	% water restored/ replenished in watersheds	90%		
	Energy	% energy from renewable sources	100 %	% waste energy that is recovered	90%						
	GHG	GHG emission reduction attributable to circular initiatives	5%								
Organization	Jobs	No. of direct/indirect jobs generated through CI	10K	No. of micro enterprise partners engaged through CI	20						
	Leader ship	No. of CE specific targets established	10	% leadership remuneration linked to CE targets	10%						
Value Realization	Cost	R&D and CAPEX investments in circular initiatives	USD 1M								
	Revenue	Absolute increase in revenue from circular products	USD 10M								

Legend on material classification

- Overall KPI score at entity/organization level
- Plastic
- Tires
- Aluminum
- Steel
- Hazardous
- Batteries
- Engines


Now the big question is:
What is the way ahead?

Setting the foundation for *The Next Phase...*

PHASE 1

PHASE 2

Measure circular KPIs

- Examine company's current circularity initiatives
- Map these initiatives to the KPIs provided in the CE Measurement framework
- Refer this playbook guide to calculate and measure circularity across the 22 defined KPIs
- Set these circularity scores across KPIs as the baseline numbers

Stress testing

- Collaborated with Mahindra to stress test (check and validate) the implementation feasibility of the 22 KPIs, their definitions and formulas
- Captured any data related hiccups, definitional requirements and way forward to resolve them
- Integrated key learnings from stress testing into the playbook
- Promote adoption of the CE Measurement Framework Playbook- Phase 1

Post adoption

- Analyze baselines numbers for all companies in the automobile sector
- Set benchmark scores for each KPI based on the above analysis
- Companies will be able to calculate an overall circularity score based on level wise benchmarks
- Companies can establish KPI specific circularity targets and measure success to achieve them

The ABCD approach

Analyze

With phase 1 adoption of the framework, companies will calculate the circularity across the KPIs, and we will analyze these baseline numbers across Automotive companies

Benchmark

Post analyzing the baseline numbers, we will set up a level-based benchmark for each KPI as per the industry trends

Calculate

Companies will be able to calculate overall circularity score using the level-based benchmarks across all KPIs

Deep dive

Using this uniform framework, companies can benchmark & evaluate circularity with peers to develop future initiatives

Conclusion

The objective of businesses in the 21st century is to reach net zero in time to prevent a worldwide catastrophe. It is not just a moral requirement but also an **unprecedent opportunity** for the automotive industries to future-proof their business models and add value over the long term. Without decoupling growth from linear resource use, companies will cross planetary boundaries of resource usage and environmental impact. Transitioning from a **take-make-waste model to a circular economy** rebuilds value chains to create waste-less and restorative systems.

By the virtue of environmental laws, regulations, and competitive pressures, automotive players are already focusing heavily on pathways to decarbonize their value chain. The circular economy measurement framework requires them to **take one step further** by measuring the outcomes of their circular initiatives at an organizational level. Conducting this exercise would require automotive manufacturers to **collaborate with various stakeholders** within and outside their organizations. Detailed LCA of priority products/product groups can help automotive companies understand the material footprint and related impacts to determine the correct course of circular interventions at product level.

This playbook aims to help any automotive manufacturing company to **begin to adopt circularity measurement** across its entire operations. More than a playbook guide created for defining the first steps towards circular economy measurement, this playbook is intended as a **long-term companion on a challenging but highly rewarding path**. Once organizations start defining measurements for circularity, they will be set on a **path of circularity adoption** that would help companies to reduce linear resource consumption, aid to save environment, involve leadership for circularity initiatives and discover pathways to value realization.

For the automotive industry, setting up a roadmap towards measuring circularity is an unprecedented opportunity to create long-term value. By placing this challenge at the heart of their businesses, they will realize a competitive advantage that will carry them well into the future. As we have seen, the stakes are now simply too high, and the value-creation opportunities too great, to delay action. Each and every automotive company can accelerate their journey by defining the specific steps to achieve their circularity goals and targets. We hope that this guide will help you navigate your company's path to circularity.

Glossary – Definition of Key Terminologies

- **Circular Economy/Circularity** [41]**:** The circular economy is a system where materials never become waste and nature is regenerated. In a circular economy, products and materials are kept in circulation through processes like maintenance, reuse, refurbishment, remanufacture, recycling, and composting. (Ellen MacArthur Foundation)
- **Extended Producer Responsibility** [42]**:** means the responsibility of a producer for the environmentally sound management of the product until the end of its life (CPCB, EPR PWM Amendment Rules 2022)
- **PIBOs** [42]**:** The following entities shall be covered under the Extended Producer Responsibility (EPR India) obligations and provisions of these guidelines namely: (i) Producer (P) of plastic packaging;(ii) Importer (I) of all imported plastic packaging and / or plastic packaging of imported products;(iii) Brand Owners (BO) including online platforms/marketplaces and supermarkets/retail chains other than those, which are micro and small enterprises as per the criteria of Ministry of Micro, Small and Medium Enterprises, Government of India.;(iv) Plastic Waste Processors (CPCB, EPR PWM Amendment Rules 2022)
- **Non-virgin/recycled input** [43] – Material that replaces virgin materials, which are purchased or obtained from internal or external sources, and that are not by-products and non-product outputs (NPO) produced by the organization (GRI)
- **Recyclable materials** [15] – Materials which may be collected, separated or processed and returned to the economic mainstream in the form of secondary raw materials or products (ESRS)
- **Repairability** [16] – To extend a product's lifetime by restoring it after breakage or tearing, without changes made to the product or its functionality. (CTI definition)
- **Bio-based materials** [45] – Materials that mainly consist of a substance (or substances) derived from living matter (biomass) and either occur naturally or are synthesized, or it may refer to products made by processes that use biomass (US EPA)
- **Biodegradable materials** [41] – Able to be broken down into carbon dioxide, water, and bio-weight by the natural action of microorganisms over an unspecified length of time and in undefined conditions. (Ellen Macarthur Foundation)
- **Compostable materials** [41] – able to be broken down into carbon dioxide, water, and bio weight within a specific time-frame under specific conditions (Ellen Macarthur Foundation)
- **Hazardous waste** [45] – As per CPCB, Hazardous Waste is classified as:
  - i **Toxic:** Waste that contains substances that are harmful to human health or the environment, and can cause adverse effects when ingested, inhaled, or come into contact with the skin.
  - ii **Reactive:** Waste that is unstable and can cause explosions, fires, or release toxic gases when exposed to heat, pressure, or other substances.
  - iii **Flammable:** Waste that can easily catch fire and sustain combustion under specific conditions.
  - iv **Corrosive:** Waste that can corrode or eat away at metals or other materials.
  - v **Infectious:** Waste that contains pathogens (e.g., bacteria, viruses, parasites) capable of causing diseases in humans or animals.

(To align with GRI 306 and UNEP international hazardous waste standards, refer to Annex III (Glossary) of Basel Convention)

- **Landfilling** [15] – Final depositing of solid waste at, below, or above ground level at engineered disposal sites; In the context of waste reporting, landfilling refers to depositing of solid waste in sanitary landfills and excludes uncontrolled waste disposal such as open burning and dumping. (ESRS)
- **Incineration** [15] – Controlled burning of waste at high temperatures. Incineration of waste can be carried out with or without energy recovery. It is **with energy recovery** when the energy created in the combustion process is harnessed for re-use, for example for power generation. It is **without energy recovery** when the heat generated by combustion is dissipated in the environment. (ESRS)
- **Effluents** [25] –Treated or untreated waste-water that is discharged (GRI 303)

- **Recycling** [15] – Reduce a product all the way back to its basic materials, reprocessing and using them to make new products, components or materials. (ESRS)
- **Reuse** [16] –The repeated use of a product or component for its original intended purpose without significant modification, but potentially involving cleaning or small adjustments so it is ready for the next use. (ESRS)
- **Upcycle** – Process of transforming waste materials or unwanted products into new materials or products of higher quality or environmental value. It is a form of recycling that creates a new product with a higher value than the original product. (Accenture Research)
- **Refurbish** [41] – Return a product to good working order. This can include repairing or replacing components, updating specifications, and improving cosmetic appearance (Ellen Macarthur Foundation)
- **Remanufacture** [41] – Re-engineer products and components to as-new condition with the same, or improved, level of performance as a newly manufactured one (Ellen Macarthur Foundation)
- **Recovery Potential** [16] – Redesign to incorporate, among others, modular design, design for disassembly, high recyclability by using mono-materials (technical cycle) and/or biodegradability and non-toxicity (biological cycle) (CTI)
- **Recirculated Sources** – Refers to the procurement of recycled/ treated water from either municipal water suppliers, municipal wastewater treatment plants, public or private utilities, and other organizations involved in the provision, transport, treatment of tertiary treated recycled water to reduce the dependence on fresh water (Accenture Research)
- **Water withdrawal** [43] – sum of all water drawn from surface water, groundwater, seawater, or a third party for any use over the course of the reporting period (GRI)
- **Water Intensity** – Metric providing the relationship between a volumetric aspect of water and a unit of activity (products, sales, etc.) created (ESRS E3)
- **Water Stewardship Programs** [43] – use of water that is socially equitable, environmentally sustainable, and economically beneficial, achieved through a stakeholder-inclusive process that involves facility- and catchment-based actions (GRI)
- **Water stress** [43] – ability, or lack thereof, to meet the human and ecological demand for water (GRI)
- **Watershed** [46] – Watershed is a geographical unit with a common natural drainage outlet. The extent varies from 500 (micro-watershed) to 5000 ha (sub-watershed). For management purposes. 5000 ha is considered as a unit of intervention. (MyGov.in)
- **Renewable sources** [32] – sources that are capable of being replenished in a short time through ecological cycles or agricultural processes (Source: GRI 302)
- **Circularity measures** [43] – measures taken to retain the value of products, materials, and resources and redirect them back to use for as long as possible with the lowest carbon and resource footprint possible, such that fewer raw materials and resources are extracted, and waste generation is prevented (GRI)
- **Circular initiatives** – Initiatives focused on and driving circularity and resource efficiency, fitting under below categories (non-exhaustive):
  - i Circular design interventions, relevant to both the product and packaging, that would optimize packaging, reduce virgin input, move to biobased inputs or improve recyclability
  - ii Interventions focused on resource efficiency through circularity focused on raw material, water and energy.
  - iii Interventions to recover (recovery types defined) the waste across the value chain, including post consumer waste and the overall waste management
  - iv Initiatives focused on or leveraging new circular models and partnerships that improves recoverability, the recycling ecosystem/infrastructure and traceability of materials. (Accenture Research)
- **Waste gas/heat/energy** [47] – Waste heat is heat, which is generated in a process by way of fuel combustion or chemical reaction, and then "dumped" into the environment even though it could still be reused for some useful and economic purpose. The essential quality of heat is not the amount but rather its "value". (Bureau of Energy Efficiency, India)

Glossary – Recyclable Plastics in Automotive Ind. [48]

Plastic Type [40]	Properties [40]	Usage	Recyclability Difficulty		Quality After Recycling and Usage	Usage after recycling process
Poly propylene (PP) 	▪ Chemically resistant ▪ Impermeable to water	Automobile bumpers, battery boxes, petrol/ diesel storage tanks, dashboards, door panels		**Highly recyclable**	Maintains good mechanical properties	Car bumpers and fenders, Interior trims, battery cases
Polyurethane (PU) 	▪ High resilience, Flexible	Foam seals and gaskets, suspension bushings, hard plastic parts for electronics mounting, cushions		**Challenging to recycle**	Reduction in quality after recycling	PU is down-cyled and reused as foams for Automotive seats (ongoing research)
Polyethylene (PE)  	▪ Good chemical resistance ▪ High Durability & strength	Reinforced car bodies, electrical insulation, packaging in new cars		**Recyclable**	High for HDPE, poor recovery rate for LDPE, Quality depends on recycling process	Plastic lumbar, fuel tanks
Polyvinyl Chloride (PVC) 	▪ Tensile strength ▪ Good chemical resistance and solvent attack	Chemical tanks, Doors, Electrical cable sheaths		**Recyclable but requires careful separation**	Poor recovery after recycling, Quality varies based on the recycling process	Automotive interior trims, under-car abrasion coatings
Acrylonitrile Butadiene Styrene (ABS) 	▪ Weather resistance ▪ Impact resistance ▪ Durable thermoplastic	Car covers, Car dashboards		**Recyclable**	Quality can be maintained with proper processing	Housing pipes, fittings, Various automotive components, bumpers
Polycarbonate (PC) 	▪ Weather, UV resistance ▪ Transparent plastic	Headlamps, Car bumpers		**Recyclable but can be challenging**	Quality can be maintained with suitable processing	Recycled Automobile headlights, taillights
PA (Polyamide) or Nylon 	▪ Resistance to abrasion ▪ Low friction property	Weatherproof coatings, bearings, gears, bushes		**Recyclable**	Retains the strength and durability after processing, Nylon is hard to recycle	Air bags, intake manifolds, Engine parts
Polyethylene Terephthalate (PET) 	▪ Thermal stability ▪ Low water absorption	Wiper arms and its gear housings, Engine covers		**Highly recyclable**	Suitable for various applications after recycling	Recycled PET is used as fibres in Automotive textiles, insulation

Glossary – Batteries in Automotive Ind.[49]

Battery Type	Properties	Usage in Automotive Industry	Recyclability Difficulty		Quality After Recycling and Usage
Lead Acid batteries	▪ Relatively heavy ▪ Low energy density ▪ Inexpensive and easy to manufacture	Starting IC engines, lighting and auxiliary power, used in hybrid vehicle electrical system.		**Highly recyclable**	Very little loss in quality, more than 95% of the components can be reused
Lithium-ion batteries	▪ High energy density ▪ Light in weight	Power source for EVs & plug-in Hybrid vehicles for propulsion and auxiliary functions.		**Complex**	Depending on the quality of the recycling, high value metals can be recovered and used in the manufacturing of new batteries or other high value products
Nickel Metal Hydride (NiMH) batteries	▪ Moderate energy density ▪ Relatively higher durability	Used as a power source in older hybrid vehicles.		**Recyclable but complex**	Possible to recycle but complex due to chemistry. Electronics and steel production with the recycled materials is possible
Nickel Cadmium (NiCd) batteries	▪ Very Long life cycle ▪ High durability	Used as a power source in older hybrid vehicles.		**Recyclable**	Manufacturing of new batteries, recycled mostly to extract metals
Solid state batteries	▪ Higher density ▪ Higher charging speed ▪ Improved safety	Emerging technology to act as the power source in EVs		**In development**	Depends on the technology development

References for Automotive

1. Accenture Study – Creating business value through car circularity https://www.accenture.com/content/dam/accenture/final/a-com-migration/pdf/pdf-177/accenture-wef-driving-ambitions-report-2022.pdf#zoom=50
2. Decarbonizing practices in the global automotive industry (Whitepaper – Siemens AG and Frost & Sullivan)https://assets.new.siemens.com/siemens/assets/api/uuid:126d82a4-ff96-4d74-bf52-28281e719488/whitepaper-decarbonizing-practices-in-the-global-automotive-indu.pdf
3. Used Car Market in India Size & Share – Mordor Intelligence Market Report https://www.mordorintelligence.com/industry-reports/india-used-car-market
4. Statista – Carbon dioxide emissions from passenger cars worldwide from 2000 to 2020 https://www.statista.com /statistics/1107970/carbon-dioxide-emissions-passenger-transport/
5. Mercedes Benz Sustainability Report 2022 https:// sustainability report.mercedes-benz.com/2022/
6. General Motors Sustainability Report 2022 https:// www.gmsustainability.com/_pdf/resources-and-downloads/GM_2022_SR.pdf
7. Kia Motors Sustainability Report 2022 https://worldwide.kia.com /int/company/sustainability/sustainability-report
8. Accenture Global Automobile Consumer Survey 2021 https://newsroom.accenture.com/news/2021/two-thirds-of-consumers-are-sustainability-minded-drivers-accenture-report-finds#:~:text=Not%20only%20are%2064%25%20of,fuel%20or%20fuel%20cell%20electric.
9. Vehicle Scrappage Policy –https://auto.economictimes.indiatimes.com /news/industry/what-is-indias-vehicle-scrappage-policy-all-you-need-to-know-about-the-voluntary-vehicle-fleet-modernization-programme/101693868
10. EPR for Waste Tyre Management – Hazardous and Other Waste (Management and Transboundary Movement) Amendment Rules, 2022 https://cpcb.nic.in/uploads/hwmd/HOWM-Sixth-Amendment-Rules-2022.pdf
11. Accenture Circular Economy Handbook https:// www.accenture.com/in-en/about/events/the-circular-economy-handbook
12. Volvo Annual and Sustainability Report 2021 https://www.volvogroup.com /content/dam/volvo-group/markets/master/investors/reports-and-presentations/annual-reports/annual-and-sustainability-report-2021.pdf
13. GRI 301: Materials 2016 https://www.globalreporting.org/standards /media/1008/gri-301-materials-2016.pdf
14. SEBI's Business Responsibility and Social Report https://www.sebi.gov.in /sebi_data/commondocs/may-2021/Business%20responsibility%20and%20sustainability%20reporting%20by%20listed%20entitiesAnnexure1_p.PDF
15. ESRS E5 Resource Use and Circular Economy, 2022, https://www.efrag.org/Assets/Download?assetUrl=%2Fsites%2Fwebpublishing%2FSiteAssets%2FED_ESRS_E5.pdf&AspxAutoDetectCookieSupport=1
16. WBSCD Circular Transition Indicators v4.0 – Metrics for business, by business 2023 https://www.wbcsd.org/contentwbc/download /16345/233646/1

References for Automotive

17. Battery Waste Management Rule 2022 https://cpcb.nic.in /uploads/hwmd/Battery-WasteManagementRules-2022.pdf

18. Ford Motors Integrated Sustainability and Financial Report 2023 https://corporate.ford.com/content/dam/corporate/us/en-us/documents/reports/2023-integrated-sustainability-and-financial-report.pdf

19. Hyundai Sustainability Report 2023 https://www.hyundai.com/content/dam/hyundai/ww/en/images/company/sustainability/about-sustainability/hmc-2023-sustainability-report-en-v5.pdf

20. GRI 306: Waste 2020 https://www.globalreporting.org/standards /media/2573/gri-306-waste-2020.pdf

21. General Motors Sustainability Report 2022 https://www.gmsustainability.com/_pdf/resources-and-downloads/GM_2022_SR.pdf

22. Honda Sustainability Report 2022 https://global.honda /en/sustainability/cq_img/report/pdf/2022/Honda-SR-2022-en-055-078.pdf

23. Guidelines for Environmentally Sound Management of End-of-Life Vehicles (ELVs) https://cpcb.nic.in/openpdffile.php?id=TGF0ZXN0RmlsZS9MYXRlc3RfMTEzX0RyYWZ0X0d1aWRlbGluZXNfRUxWLTFfLnBkZg==

24. Mercedes Benz Sustainability Report 2022 https://sustainabilityreport.mercedes-benz.com/2022/_assets/downloads/entire-mercedes-benz-sr22.pdf

25. GRI 303: Water and Effluents 2018 https://www.globalreporting.org /standards/media/1909/gri-303-water-and-effluents-2018.pdf

26. AWS International Water Stewardship Standard https://a4ws.org/wp-content/uploads /2019/03/AWS_Standard_2.0_2019_Final.pdf

27. ISO 14046:2014 https://www.iso.org/obp/ui/#iso:std:iso:14046:ed-1:v1:en

28. ESRS E3 Water and marine resources, 2023, https://www.efrag.org /Assets/Download?assetUrl=%2Fsites%2Fwebpublishing%2FSiteAssets%2FED_ESRS_E3.pdf

29. Tata Motors Annual Report 2022-23 https://www.tatamotors.com /wp-content/uploads/2023/10/annual-report-2022-2023.pdf

30. Mahindra and Mahindra Sustainability Report 2021-22 https://www.mahindra.com/sites/default/files/2023-01/Mahindra-Sustainability-Report-2021-22_0.pdf

31. Toyota Sustainability Data Book 2022 https://global.toyota/pages /global_toyota/sustainability/report/sdb/sdb22_en.pdf

32. GRI 302: ENERGY 2016 https://www.globalreporting.org /standards/media/1009/gri-302-energy-2016.pdf

33. ISO 50001: Energy Management Systems https://www.iso.org /iso-50001-energy-management.html

34. KIA Sustainability Report 2023 https://worldwide.kia.com /int/company/sustainability/sustainability-report

35. GRI 201: Economic Performance 2016 https://www.globalreporting.org /standards/media/1039/gri-201-economic-performance-2016.pdf

36. Digital Product Passport – European Health & Digital Executive Agency https://hadea.ec.europa.eu/calls-proposals/digital-product-passport_en

References for Automotive

37. EU Battery Regulations 2023 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32023R1542

38. CO_2 emission performance standards for cars and vans https://climate.ec.europa.eu/eu-action/transport/road-transport-reducing-co2-emissions-vehicles/co2-emission-performance-standards-cars-and-vans_en

39. Corporate Average Fuel Economy Norms for Passenger Cars, India https://beeindia.gov.in/en/programmesenergy-efficiency-in-transport-sector/fuel-efficiency

40. Recommendations of the Taskforce on Nature-related Financial Disclosures, 2023 https://tnfd.global/wp-content/uploads/2023/08/Recommendations_of_the_Taskforce_on_Nature-related_Financial_Disclosures_September_2023.pdf?v=1695118661

41. Ellen Macarthur Foundation, "What is a Circular Economy", https://www.ellenmacarthurfoundation.org/topics/circular-economy-introduction/glossary

42. Central Pollution Control Board, PWM Amendment 2022, https://cpcb.nic.in/uploads/plasticwaste/PWM-Amendment-Rules-2022.pdf

43. GRI Glossary https://www.globalreporting.org /standards /media/2594/gri-standard-glossary-2020.pdf

44. US EPA Science Inventory – Bio based material https://cfpub.epa.gov /si/si_public_record_report.cfm?Lab=NRMRL&dirEntryId=231873#:~:text=Biobased%20materials%20refer%20to%20products,by%20processes%20that%20use%20biomass.

45. CPCB, Hazardous Waste Management Rules, https: //cpcb.nic.in/rules/

46. MyGov, Watershed Management https://www.mygov.in /group/watershed-management0/#:~:text=Watershed%20is%20a%20geographical%20unit,as%20a%20unit%20of%20intervention.

47. Bureau of Energy Efficiency India, "WASTE HEAT RECOVERY", https://beeindia.gov.in/sites/default/files/2Ch8.pdf

48. Glossary – Types of Recyclable Plastics in Automotive Industry https://www.mtf.stuba.sk/buxus/docs/internetovy_casopis/2010/3/szeteiova.pdf

49. Glossary – Types of Battery in Automotive Industry https://batteryuniversity.com/articles

Acknowledgements

Program Sponsors

Lead Sponsor

EU REI

Industry Sponsors

JSW Steel Limited

GRP Ltd

Aditya Birla Fashion & Retail Ltd

SABIC

Accenture Team

Scott Pharr
Senior Managing Director, Accenture Strategy

Sundeep Singh
Study Lead & Managing Director, Sustainability Strategy

Shruti Rangarajan
Managing Director, Automotive Industry Consulting

Apoorva Khamesra
Study & Circular Lead, Sustainability Strategy

Anurodh Sachdeva
EPR & Circular Expert, Sustainability Strategy

Meghana V Mavathur
Circular Expert, Sustainability Strategy

Sabarinath Rajesh Nair
Circular Expert, Sustainability Strategy

FICCI Team

Jyoti Vij
Additional Director General, FICCI

Mritunjay Kumar
Director, FICCI

Tanya Khanna
Assistant Director, FICCI

EU REI Team

Micheal Bucki
Counsellor and Head of Section, EU Delegation to India

Rachna Arora
Team Leader, EU REI

Reva Prakash
Deputy Team Leader, EU REI

Industry Consultation

- ITC Ltd
- Tata Sons Pvt Ltd
- Hindustan Unilever Ltd
- Saahas Zero Waste Ltd
- Huhtamaki Ltd
- DS Group
- Mondelez India Foods Private Ltd
- Mahindra & Mahindra Private Ltd
- Tata Motors Ltd
- Maruti Suzuki India Ltd
- Honda Motors Co. Ltd
- Skoda Auto Volkswagen India Pvt. Ltd.
- Abilities India Piston and Rings Ltd
- Sundaram Auto Components Ltd.

Stress Testing Partners

- ITC Ltd
- Mahindra & Mahindra Private Ltd

ABOUT FICCI

Established in 1927, FICCI is the largest and oldest apex business organisation in India. Its history is closely interwoven with India's struggle for independence, its industrializa-tion, and its emergence as one of the most rapidly growing global economies.

A non-government, not-for-profit organisation, FICCI is the voice of India's business and industry. From influencing policy to encouraging debate, engaging with policy makers and civil society, FICCI articulates the views and concerns of industry. It serves its members from the Indian private and public corporate sectors and multinational companies, drawing its strength from diverse regional chambers of commerce and industry across states, reaching out to over 250,000 companies.

FICCI provides a platform for networking and consensus building within and across sectors and is the first port of call for Indian industry, policy makers and the international business community.

ABOUT ACCENTURE

Accenture is a global professional services company with leading capabilities in digital, cloud and security. Combining unmatched experience and specialized skills across more than 40 industries, we offer Strategy and Consulting, Interactive, Technology and Operations services - all powered by the world's largest network of Advanced Technology and Intelligent Operations centers. Our 721,000 people deliver on the promise of technology and human ingenuity every day, serving clients in more than 120 countries. We embrace the power of change to create value and shared success for our clients, people, shareholders, partners and communities.

Visit us at www.accenture.com