REDUCE • REUSE • RECYCLE

चक्रीयता

CIRCULARITY

An initiative by SIAM

SIAM

Society of Indian Automobile Manufacturers

Building the Nation, Responsibly.

CONTEXT PAPER

ELV RECYCLING

STATUS OF CIRCULAR ECONOMY IN INDIA

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About SIAM

SIAM works towards supporting the sustainable development of the Indian Automobile Industry with the vision that India emerges as the destination of choice in the world for design and manufacture of automobiles. It facilitates enhancement of the competitiveness of the Indian Automobile Industry, reducing cost of vehicles, increasing productivity, and achieving global standards of quality.

SIAM provides a window to the Automobile Industry in India and works closely with stakeholders in the formulation of the economic and commercial policies, regulations and standards relating to automobiles. It provides economic and statistical information as well as technical and public policy services to the stakeholders on behalf of the Indian Automobile Industry. It publishes Monthly Industry Statistics, Monthly Commodity Price Monitor, and other periodic reports. It also organises international conferences, seminars, and workshops on the topics of topical relevance and interest to the industry, and also on global best practices prevailing in the sector.

SIAM has deep interface with the Indian Government and with international bodies like JAMA (Japan Automobile Manufacturers Association), ANFAVEA (National Association of Automotive Vehicle Manufacturers, Brazil), ABRACICLO (Brazilian Association of Motorcycle, Moped, and Bicycle Manufacturers) etc. SIAM, jointly with ACMA and CII organises Auto Expo, a widely awaited biennial auto exhibition highlighting the trends in technological advancement adopted in the Auto Industry. SIAM also organises regional as well as segment specific shows across the country.

SIAM aims to promote sustainable mobility through environmental, social, and economic sustainability, to address climate change, air quality improvement, compliance with standards and promotes growth with responsibility by focusing on several areas:

- Improve Indian automotive industry's competitiveness
- Promote and foster sustainable mobility eco-system
- Promote development of Alternative Energy Vehicles
- Achievement of leadership in manufacturing and innovative technology

Executive Summary

Sustainability has been on the agenda for automotive organizations for some time now, but it has achieved a new urgency and importance today. Corporates today are reaffirming their focus on sustainability strategy at the corporate level into three key areas: climate action, circular economy, and ethical and responsible business. OEMs today are ensuring sustainability in their operations and working with their entire supply chain network to make entire value chain sustainable.

India is an automotive behemoth with approximate 29.5 crores vehicles running on roads. With an estimated 2 crore vehicles added every year and expanding middle class in this growing economy, the vehicle parc is bound to increase exponentially. Additionally, the automobile sector is the biggest contributor to the manufacturing GDP of India and aims to give employment to more than 4 crore families. India has embarked upon the development of sustainable practices in automotive sector, which ensure continuous improvement in production, usage, reuse and disposal practices related to vehicles. With the increase in the growth of automotive sector, management of ELVs is critical and requires attention. The environmentally sound management of ELV is of vital importance for environment conservation, circular economy and sustainable development.

India has adopted the 17 Sustainable Development Goals for 2030 developed by UN Department of Economic and Social Affairs. SIAM aims to promote SDGs related to automotive sector by bolstering dissemination and implementation of safe vehicles, sustainable and affordable mobility. Moreover, GoI also initiated the ""Guidelines for the Environmentally Sound Management of ELVs in India", which was further revised in 2019 to "Guidelines for Environmentally Sound Facilities for Handling, Processing and Recycling of End-of- Life Vehicles (ELV)" as the legislative framework towards environment protection.SIAM has planned to focus on fleet modernization to ensure induction of safe vehicle technologies. These will allow lower emissions from the mobility sector and thus decarbonisation of the vehicle parc. Newer technologies will also stimulate adoption of vehicles safer for Indian roads and cleaner for air quality. Awareness about sustainable recycling practices will allow the automotive players to be ready for newer technologies and make the industry eco-efficient from the get-go. This will also enable eco-design and green manufacturing practices in the mobility industry of India for years to come.

Indian government's major focus is to regulate and recycle discarded material and old vehicles, which are harmful to the ecology and environment. The process of utilizing discarded material and ELVs will assure feedstock supply for the vehicle recycling ecosystem that will be built in the years to come. By collaboration with unorganized sector, the new recycling practices will be promulgated to all the players and produce multiple avenues of economic benefit to the nation.

SIAM aims to bring societal benefits through safe recycling practices. Reduction in imports due to advanced circular economy will save energy and emissions owing to lower mining. By practicing safe recycling processes, SIAM aims to reduce the

environment impact of the current unorganized practices and move India towards the implementation of ESGs and achievement of SDG 2030.

Highly efficient recycling processes will reduce the raw material requirement for the automotive sector of India. Ample amount of the cost arising on the sourcing side will be reduced because of material sourced from recycling practices in the new ecosystem. On a country level, this will help in forex reserve conservation and reduce dependency on external players. This will also steer the country towards its goals of 'Aatmanirbhar Bharat'.

Introduction

With increasing global focus on sustainability and reducing environmental impact, the concept of circular economy has become important for different sectors of the economy. A circular economy is an instrument to tackle the current crises on climate, biodiversity and pollution. By keeping resources in the loop for longer, circular economy helps to reduce greenhouse gases, pollution and environment degradation caused by the energy needed to make products. It will also lead to lesser energy and mining by reducing raw material requirement.

In the context of the Indian automobile industry, a focus on circular economy will help the industry and country reduce raw material imports by recycling the large fleet of old vehicles present in the country. This will not only help conserve foreign exchange but will also help generate employment through development of the complete recycling ecosystem. Recycling of old vehicles will also help improve safety and reduce emissions by removing older vehicles with newer, more fuel-efficient vehicles. Formalization of the recycling ecosystem in India, which currently utilizes manual and unscientific methods for end-of-life vehicle recycling, will help reducing environmental contamination due to such unsafe practices and also improve health and safety for workers in the sector. On an organisation level, a sustainable strategy at corporate level will trickle down to bring required changes in processes of the organization and its partners.

With the electric mobility transition underway in the country and globally, the circular economy concept becomes more important as shift to electric mobility will increase material's share in automotive lifecycle emissions, thus increasing the importance of circular practices further. The government support has been evident according to the regular policy updates and releases related to recycling in Indian mobility.

Given the increasing importance of circular economy concept, this paper focuses on understand and evaluating the importance, current state and future imperatives for the end-of-life vehicle recycling in India.

Current ELV recycling

India currently is the fourth largest car market in the world. Indian customers have both a sentimental and utilitarian value with their vehicles. This brings in a big challenge concerning parting with the vehicle for disposal, scrapping, or recycling, once it becomes old. Unlike advanced countries, the Indian automobile recycling systems have not evolved in tandem with the growth of the automotive industry. Most of the old vehicles find their way to unorganised scrap handling markets, or left at police stations due to non-settlement of legal cases, while some have been found abandoned in remote areas where they tend to decay in the open, impacting the surrounding environment.

The improper disposal of older vehicles has started to adversely affect the Indian roads, leading to large-scale air pollution as well as land and water contamination, and forming massive traffic congestions. Indian scrappage industry currently is highly fragmented and localized to specific urban centres.

As per directions of the Hon'ble National Green Tribunal, Principal Bench, New Delhi, (in the matter of Original Application No. 996 of 2018; News items published in The Times of India Authored by Paras Singh Titled “In factory setting, Mayapuri's scrapping through”) led CPCP to take cognizance of the fact and created “Guidelines for Environmentally Sound Facilities for Handling, Processing and Recycling of End-of- Life Vehicles (ELV)”.

Fig1: Major Automobile recycling centres of India

While the scrappage players in these centres have come up through the years in a highly unorganized manner. Most of the traders in these clusters have been working in this segment for 10-20 years and have a good knowledge of how most parts of the vehicle can be recovered and utilized. However, this led to environment degradation leading to the intervention of the authorities and creation of guidelines for their safe and sound management.

The lack of infrastructure and proper regulatory mechanism for efficient disposal of ELVs has led to a very crude and rudimentary scrappage process. Basic hand tools are used for vehicle dismantling with 2-3 people taking 3 hours to dismantle a car. These clusters have an ecosystem for sourcing the vehicles, dismantling and then selling the spare parts for scrap. Although the process changes based on players and locations but the general steps of unorganized Indian vehicle scrappage process can be mapped[i].

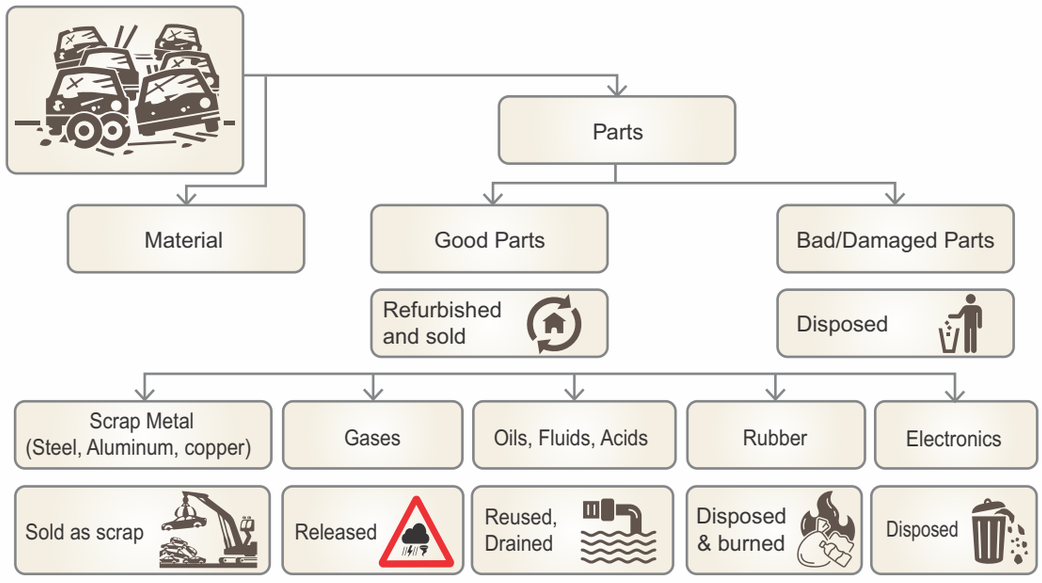


Fig 2: Typical dismantling flow of a vehicle in the unorganized recycling sector in India

The unorganized scrappage industry lacks from a standardized process flow. This leads to lower customer satisfaction due to lack of options and inefficient business processes. With the inflow of higher number of ELVs in the upcoming years, owing to the new regulations inducted by our government, safe and smooth dismantling of vehicles will become a challenge for the players and involved employees.

Table 1: Effects according to the major components of an automobile.

Vehicle Component	Disposal Method	Effects
Engine Oil, Gear Oil	Drained	• Heavy metals in oil can harm humans & other living beings; • Pollution of ground & drinking water sources[ii];
	Recycled by unorganized vendors	• Unregulated addition to GDP; • Unsafe for employees;
Transmission fluid, Coolant fluid, Power steering fluid, Brake fluid, Hydraulic fluid	Drained	• Harmful to humans & other living beings because of interim toxicity; • Vaporization & contribute to air pollution[iii];
	Recycled by unorganized vendors	• Unregulated addition to GDP; • Unsafe for employees;
Battery	Acid Drained	• Acidification of soil and ecosystem[iv]; • Leaches metals from landfilled garbage increasing the toxicity of ecosystem[v];
	Battery recycled by unorganized vendors	• Considerable amounts of lead particles and fumes emitted into the air, deposited onto soil, water bodies and other surfaces[vi] • Unregulated addition to GDP; • Unsafe for employees;
AC Gas	Released into atmosphere	• Leads to global warming • Leads to ozone layer depletion[vii]
Air Filter Oil Filter	Disposed & Burned	• Air pollution due to burning
Battery Terminal	Copper extracted	• Process unsafe for workers; • Side effects causing air and water pollution;
Metal Components	Copper extracted Steel extracted	• Unregulated addition to GDP; • Unsafe for employees; • Unsafe usage in secondary life;
Rubber	Used for Pyrolysis	• Commercially unviable • Health hazard to workers • Causes Air pollution[viii]
	Disposed in landfills	• Fire hazard • Breeding ground for mosquitoes • Leeching toxic components into ground water[ix]
Other (Paper, Asbestos)	Disposed and burned	• Highly toxic material causing asbestosis, various lung disorders • Air pollution
Electronic Parts	Disposed in landfills	• Extraction of precious metals is typically not done in an environmentally sound manner.

Apart from the hazardous issues mentioned in the table, the unorganised scrappage practices lead to potential material loss, which could have been achieved through secondary and tertiary processes. The prices of raw materials used in automotive industry has been on a continuous rise through the years.

These price increases added with the shortage of semiconductor materials, which caused a 7.7 million shortfall in vehicle production in 2021 and $210 billion in revenues alone[x], brings to focus the dire requirement of an advanced recycling ecosystem that will solve production breaks, waiting periods, and recovery issues for the automotive industry. India currently has a very few organized players in the vehicle recycling.

Cero is a joint venture between Mahindra Accelo and the State-run MSTC. With a current capacity of 50,000 units from three plants in Delhi, Pune and Chennai, Cero handles the entire process from towing a vehicle to its dismantling, de-registration and recycling and aims to expand its services in over 100 cities by 2026[xi].

Maruti Suzuki Toyotsu India (MSTI) is a joint venture (JV) between Maruti Suzuki India (MSIL) & Toyota Tsusho Corporation has opened government approved ELV scrapping and recycling unit in Noida, UP which focuses mainly on providing environmentally friendly recycling for ELV in pan India[xii]. The current Noida facility has a scrapping capacity of 24,000 units annually. Processing or scrappage time for a single car is 200 minutes[xiii].

Key Challenges

The current informal recycling industry in India poses the following challenges to transition towards a sustainable automotive recycling industry that can be beneficial to all:

No database for the recycling & disposal processes

The government cannot directly track the processes implemented in the current informal sector which can be harmful to the workers themselves and the environment.

Lack of Database of the informal players

The government cannot manage or protect the current informal players without a formal database.

Effect on the environment

Due to the lack of database, the government cannot track the ecological effect of current recycling practices.

Important avenue of employment

The work force involved with informal recycling sector doesn't come under the protection of the Indian labour laws. Without a widespread formal sector, the employment potential of recycling sector is untapped.

Important avenue of forex conservation

The lack of standardization in the recycling processes limit the usage of recycled material in the economy.

Vehicles disposed at random places

End of life and unusable vehicles disposed at various places become breeding grounds for disease spreading pathogens.

No price standards

Customers currently don't have many options readily available to adequately incentivize standardized and safe disposal.

Safety concerns related to old vehicles

Customers using old and inadequate vehicles pose a risk to road users and the environment.

Poorly trained and managed employees

The informal recycling operations are affected by poorly trained, under-motivated workers who are unaware about the labour right available to them by government.

Efficiency of the business units

Due to lack of formalized competition between recycling players across the country, the efficiency of the recycling industry in India cannot be ascertained.

Process and Safety standards missing

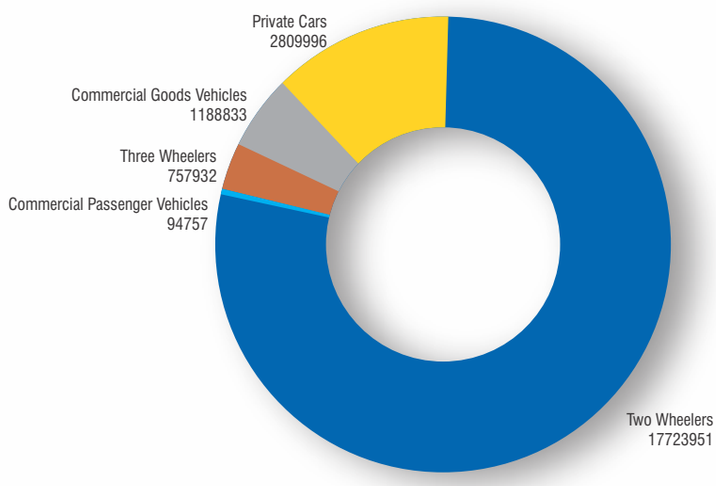
Industry employees face safety challenges including chemical exposure, combustible dust explosions, machine guarding hazards, and exposure to powerful equipment with moving parts due to lack of processes.

Poor logistics support for the feedstock

The fragmented and informal industry cannot build on efficiency or expertise due to lack of infrastructure to support feedstock availability.

Potential for ELV recycling in India

According to estimates, India will have about 22.5 million ELVs by 2025. The ELV market of India has been valued at $ 3,474 Million in 2019 with an expected growth of 17.2% CAGR in the period of 2020–2030[xiv]. It is estimated that India will have about 22.5 million End of Life Vehicles (ELVs) by 2025 which could help generate five million tonnes of steel scrap, 1.2 million tonnes of aluminium, and about 0.2 million tonnes of copper.



[xv]

Fig 3: Number of vehicles reaching obsolescence in 2025

According to the Circular Cars Initiative (CCI) of world economic forum, recycling as-a-service model, life cycle services and remanufacturing hold the potential to improve profitability by 1.5 times along the value chain. Recycling stakeholder can enable circular economy through co-innovation and partnership, and expanding into collaborative activities or the full circular value chain. For example, companies could initiate circularity by first transforming life cycle for selected vehicle models or components and later the full products[xvi].

There is also the potential to reuse materials extracted from scrappage processes for production. Materials such as recycled polyurethane foam plastic can be used in seat cushion. Scrap bumpers can be reformulated and reused to make mudguards, splashguards, and more. In FY19, only 35% of India's metal scrap consumption was met by domestic collection. That year India imported seven million tonnes of ferrous scrap, which is expected to double by FY25. The recycling of the expected ELVs by 2025 can reduce ferrous scrap imports by five million tonnes with economic and ecological benefits.

With advances in the tracking of automobiles through HSRP and digitisation of the registration process of automobiles, it will be easier to know the age and conditions of

the vehicles. The first challenge will arise due to the older vehicles with no national database or service history to check their condition.

The organized players can make use of these players as their own intermediaries and channel partners for sourcing the feedstock. This will help reduce the unhealthy competition between what these players can offer the end consumers and what an organized player does. It will also ensure that the livelihood of these people is secure. Their years of experience in this field will avoid the need for organized players to reinvent the wheel.

Additionally, India has to look outward to international markets for learnings in the recycling ecosystem. For example, since 2015, EU Member States are required to meet rates for reuse and recycling of ≥ 85% and for reuse and recovery of ≥ 95%, by an average weight per vehicle. In 2019, the reuse and recycling rate for end-of-life vehicles in the EU stood at 89.6%, 2.3% higher than in 2018 (87.3%) and 1.7% higher than in 2017 (87.9%). Advanced recycling centres similar to those in Japan and Europe can lead to 85% to 90% of material recovery from vehicles in the initial stages, and more than 95% over a period.

Table 2: Initiatives in Japan's recycling ecosystem and probable parallels in India

ELV ecosystem feature in Japan	Feasibility in India
Incentive Programs for Consumers: Eco-Car Program: It consisted of two parts[xviii]: • *Replacement program* - As a part of the program, consumers replaced an older passenger car with a new car in line with Japan's fuel standards. • *Purchase without a trade-in* - As a part of this program, new car must have 1. Fuel efficiency at least 15% higher than the standard current requirement, 2. A "4 Star" rating in emission performance, meaning emission levels 75% below standards;	*Replacement Program –* In India, we can have a replacement program where in consumers get a discount/exchange value on the older passenger car while purchasing a new car meeting India's new fuel standard. *Non-Replacement Program –* Rebates to be provided for the purchase of a new car without scrapping an older car, based on the factors like: 1. Fuel efficiency of purchased product higher than the scrapped vehicle w.r.t to the segment and cycles accepted in India. 2. Fulfilling higher standards than scrap vehicles w.r.t. the carbon & particulate emissions norms. 3. Standard requirements to be established and changed based on Indian conditions;
Prevention of Illegal Dumping of Scrap vehicles This is to reduce the illegal dumping of Scrap Vehicles in abandoned area, and to encourage consumers to scrap their vehicles to RVSF. Japan have established a prevention system for the same. (JARC)[xix]	• Policymakers need to make sure that Authorized RVSF meets the standards • Indian government can stimulate collaboration of businesses in the ecosystem, which can recycle all the components and have procedures to dispose components like shredded dust, airbags, and chlorofluorocarbons.

ELV ecosystem feature in Japan	Feasibility in India
	• Regulations can further drive recycling up to 85% reducing the waste going to landfill • Reduction in landfill area can be achieved through ASR treatment[xx]
Introduction of advance payment system for recycling fee: • 3 items that hinder the recycling of end-of-life vehicles: shredder dust, airbags, chlorofluorocarbons. • Automobile users pay in advance the costs required for the proper disposal of this items • Vehicle inspection certificate is issued only after the confirmation of the recycling fee	• Needs to be discussed with automobile manufactures so that the cost can be incorporated in the price structure • A policy for the same can be launched by the Government in conjunction with private players to digitize the process and drive the system towards sustainability
Introduction of local government registration/permission system: • All the businesses involved in recycling need to be Registered with government and legislation body • This is to encourage consumers to trust the facilities & to have a control • Under the appropriate division of roles, JARC take over and deliver end-of-life vehicles, and will take on the role of delivering the three items to automakers and importers	• Build a policy to have state government's control over the recycling businesses to check their legitimacy, equipment, safety and standardized procedures; • State level relaxation in taxes for scrappage logistics to ensure circular economy;
Recycling flow of ELV A small snippet of JARC control the recycling procedures and the process flow for the consumer	

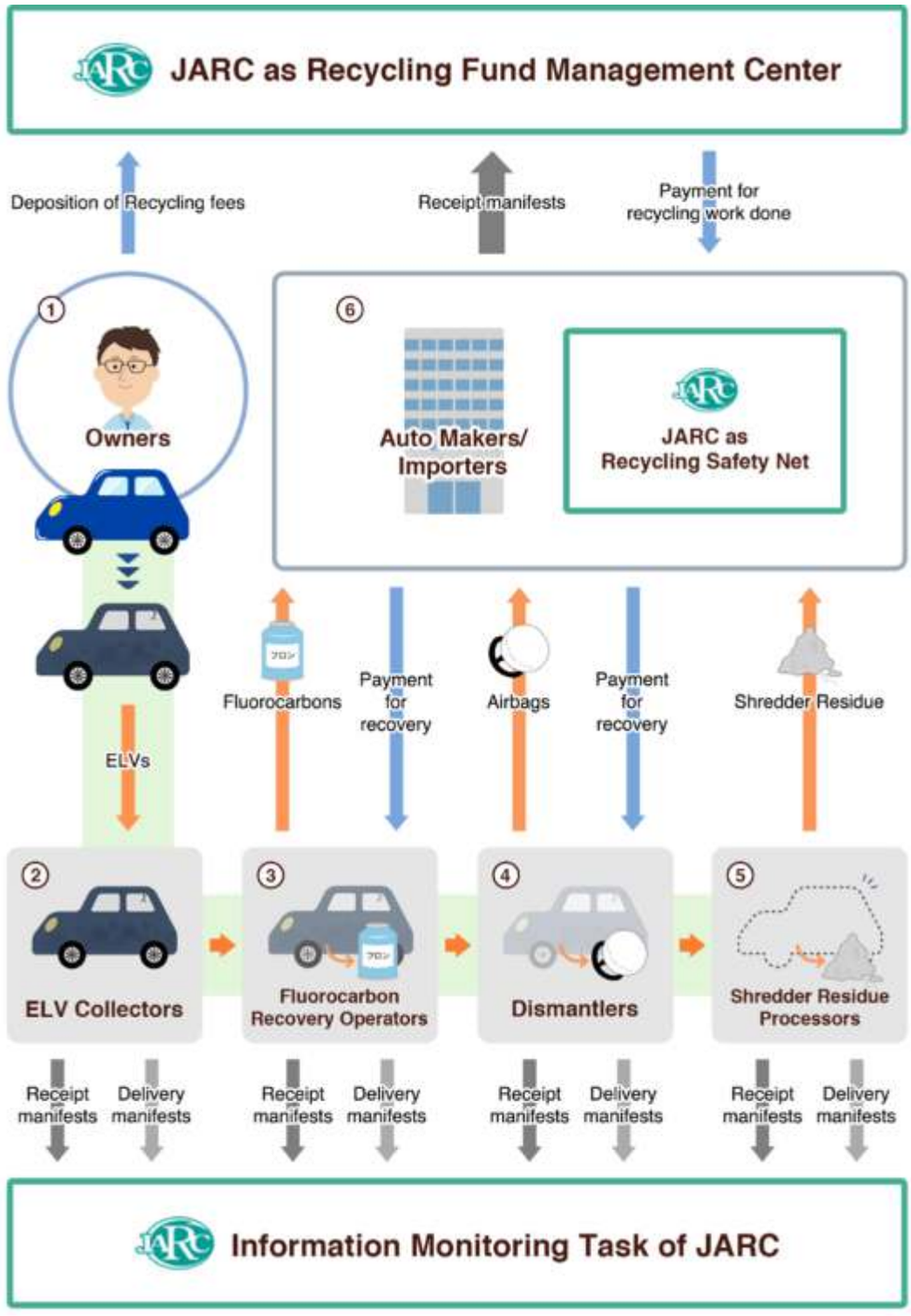


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Fig 4 : Information monitoring task of JARC

Table 3: Initiatives in Germany's recycling under "End-of-life Vehicle Ordinance" and probable parallels in India

ELV ecosystem feature in Germany	Feasibility in IndiaFeasibility in India
Transport Obligations[xxii]: • Anyone discarding, wishing to discard or having to discard a vehicle is obliged to transfer the vehicle only to an Authorized *Acceptance Facility* • Acceptance and collection facilities merely collect end-of-life vehicles (ELVs) and are obligated to transfer them only to authorised dismantling facilities for the treatment itself • *Dismantling facilities* are obligated to transfer stripped vehicles (scrap bodies, body shells) only to an authorised *shredding facility*	• Customers need to be incentivized for dropping vehicles at authorized dismantlers through credits and transport cost reimbursements • Authorized dismantlers can be given tax breaks to cover for the logistic costs of customers depending on state's road tax
Collection Obligations[xxiii]: • Vehicle manufacturers are obligated to take back any ELV of their make from the last holder • Manufacturers also have to take back ELVs free of charge once they have been transferred to an authorised collection facility or an authorised dismantling facility previously selected by the manufacturer for this purpose • Manufacturers are also obligated to ensure a broad network of options for ELVs to be returned	• Authorized dealers can have JVs and tie ups with OEMs to ensure that all new and current models are accounted for dismantling • Manufacturers should be given carbon credits (or some other index) showing their contribution to the SDG goals of the nation
EV battery regulations: • EU-wide battery regulation that is expected to drastically increase the quantity of recycled raw materials in new batteries[xxiv]. **ELV flowchart in European Union[xxvi]:**	• Strong policy to ensure recycle, reuse and efficient design of Lithium batteries • Approx. 99% of lithium recycled from batteries can be reused[xxv]

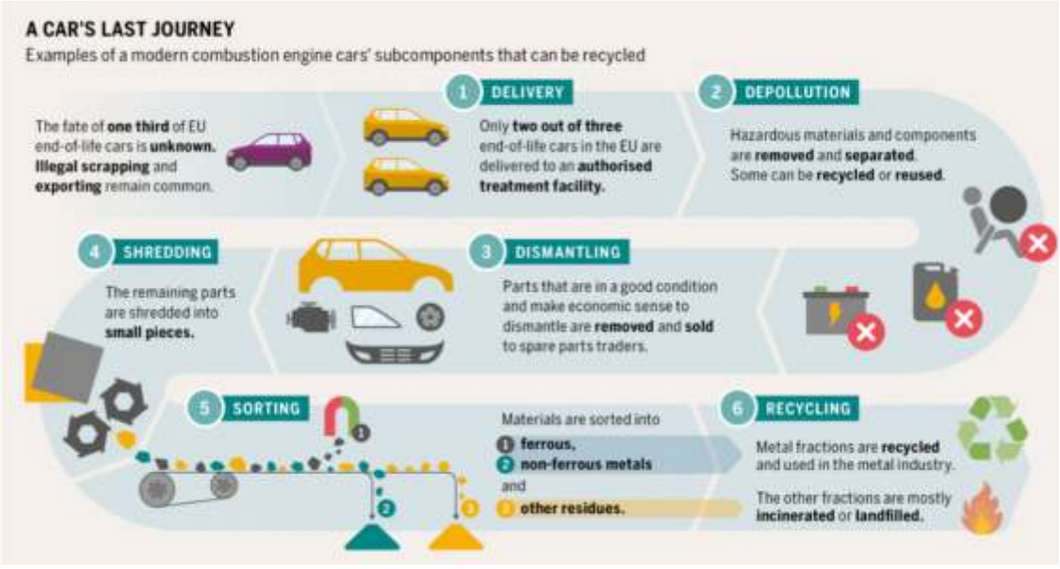

Fig 5 : A Car's Last Journey

ELV policy landscape

The Government of India has introduced Vehicle Scrappage Policy in 2021, which aims at making the Indian scrappage industry organized, transparent, and environment friendly.

As per the policy, commercial vehicles older than 15 years, and private vehicles older than 20 years are to be scrapped if they fail the fitness test & they shall be defined as ELV.

- For Heavy Commercial Vehicles (HCV), fitness testing to be conducted only through Automated Testing Stations (ATSs) from 1st April 2023.
- For all other classes of CVs as well as PVs, fitness testing through Automated Testing Station proposed to be mandated in phases from 1st June 2024.[xxvii]

सड़क परिवहन एवं राजमार्ग मंत्रालय MINISTRY OF ROAD TRANSPORT AND HIGHWAYS	**The Vehicle Scrappage Policy, 2021** **Guidelines on Provisions for End-of-Life Vehicles** **Draft amendment - June 2021**
भारी उद्योग मंत्रालय MINISTRY OF HEAVY INDUSTRIES	**National Auto Policy** **Draft Version – March 2018**
Ministry of Environment, Forest and Climate Change Government of India	**National Resource Efficiency Policy** **Draft Version – July 2019**
इस्पात मंत्रालय MINISTRY OF STEEL	**Steel Scrap Recycling Policy** **November 2019**
खान मंत्रालय MINISTRY OF MINES	**National Non-Ferrous Metals (Aluminium and Copper) Scrap Recycling Policy** **May 2020**
cpcb CENTRAL POLLUTION CONTROL BOARD Ministry of Environment & Forest (Govt. of India)	**Guidelines for Environmentally Sound Facilities for Handling, Processing and Recycling of End-of- Life Vehicles** **January 2019**
	Guidelines for Environmentally Sound Management of End-of-Life Vehicles, 2016

To bring out the benefits of the circular economy, Government of India has also launched Voluntary Vehicle Fleet Modernization Program (V-VMP) to encourage the scrapping of old vehicles. The program is aimed at creating an eco-system for phasing out of unfit and polluting vehicles[xxviii].

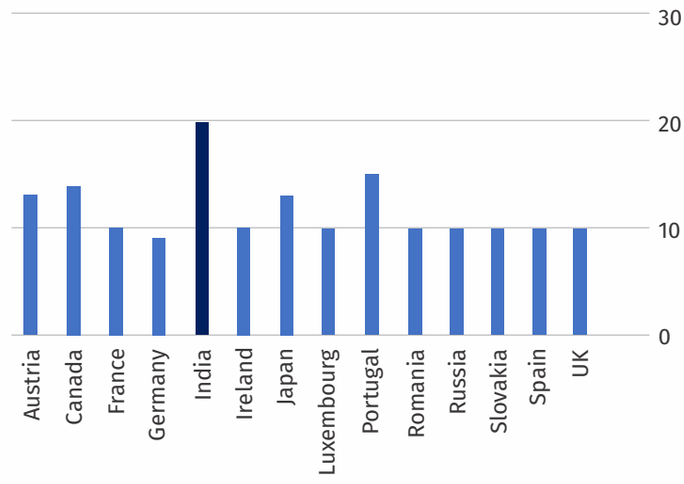

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Fig 6: End of Life Vehicle age in different countries

Policy targets voluntary scrapping of approx. 1 crore unfit vehicles strictly based on their fitness, irrespective of their age. Fees for conducting fitness test and granting fitness certificate have been increased for commercial (Transport) vehicles older than 15 years to promote timely fitness testing. The following incentives are declared for scrappage of old vehicles[xxx]:

- Owners to get a scrap value equivalent to 4-6% of ex-showroom price of the new vehicle they would be purchasing
- By showing certificate of deposit, zero registration fee applicable for new vehicle
- Vehicle manufacturers are advised to provide 5% discount of new vehicle against certificate of deposit

Additionally, a few disincentives for holding an old vehicle are mentioned in the policy document:

- Cost for renewal of fitness certificate to grow up to 62 times for CVs & up to 8 times for PVs;
- States to impose green tax over and above road tax, to be paid by all vehicle owners.

AIS (Automotive Industry Standards) amended & released a guideline of Provisions for End-of-Life Vehicles that provides details on the procedure for establishment of RVSF (Registered Vehicle Scrapping Facility). This is to have a certified Vehicle scrapping facility and to support the new Vehicle Scrappage Policy of India[xxxi].

Government of India is focused on developing vehicle scrapping facilities at a distance of approx. 150 kms from the city centres.

- Under the new policy, effective from 1st April 2022, the Centre said States & Union territories to provide upto 25% tax rebate on road tax for vehicles that are purchased after scrapping old vehicles to encourage scrapping of old vehicles
- RVSF established in a State may accept and scrap the vehicles registered in any of the State or Union Territory under the jurisdiction of any Registration Authority
- The process shall be seamlessly linked with VAHAN on pan India basis irrespective of the location of any vehicle registering authority

The policy aims to establish of 450 to 500 **automated testing stations (ATS)** and 60 to 70 **Registered Vehicle Scrapping Facilities (RVSF)** around the country.

The Government of India has moved towards EPR regime to curb pollution and encourage circular economy in the country. In 2012, the Indian government implemented EPR to handle electronic waste, and in 2016, EPR was extended to plastic waste manufacturers by plastic waste management rules[xxxii]. As per the EPR Rules published by MOEF&CC on December 2021, tyre producers will be responsible for complying with EPR regulations by acquiring EPR certifications solely from authorised recyclers. Multiple stakeholders like Central Pollution Control Board, State Control Board, Producer, Brand Owner, EPR Agency, Recycler & Co-Processor, Local Governing Body and Waste Generator will have to work in tandem to ensure that waste tyre is managed in a manner, which shall protect health and environment against any adverse effects[xxxiii].

The semi-formal ELV recycling sector currently ensures jobs for thousands of people. The entrepreneurs and workers involved in this ecosystem have active networks with access to customers & materials. Also, their year of experience ensures considerable manual skills. For many units, this semi-formal but entrepreneurial SME-based ecosystem permits profitable business operations.

According to the draft National Resource Efficiency Policy, 2019, a National Resource Efficiency Authority (NREA) is proposed to be constituted under the provisions of the Environment (Protection) Act, 1986 will be mandated to drive the agenda of resource efficiency across the country. The authority will have a function of establishing targets, set standards, create database of material lifecycle, support collaborations and ensure training mechanisms for stimulating circular economy.

Benefits of ELV Recycling to the economy

ELVs contain large quantities of metal and other materials, which, if salvaged or recycled can lead to large economic benefits in addition to the fact that it can help reduce the environmental impacts arising from production of primary materials. Following is some of the direct and indirect benefits:

- Processing of Secondary metals as a consequent to recycling will require less energy in comparison to the primary processing of metals thereby improving efficiencies of production.

- The reuse and recycling of vehicles shall lead to lower cost of manufacturing of the vehicles as in India, up to 70% of a vehicle are dismantled and the dismantles parts could be recycled.
- In the recycling process both ferrous and non-ferrous metals are recovered and directed to reuse. It has been estimated that passenger cars contain about 70% steel and 7-8% aluminium. The rest 20-25% is plastic, rubber, glass etc., which are also recyclable. Recycling one ton of steel conserves 1,134 kg of iron ore, 635 kg of coal and 54.4 kg of limestone (Sakai et al., 2013; Steel Recycling Institute 2014).

In addition, other materials such as lubricants, electronic components, waste batteries etc also provide a direct input of the raw materials which can be easily recycled.

Current developments in ELV recycling segment in India

India has already started on the path of a circular economy. Owing to the support from government and knowledge dissipation about India's path to sustainability, several new players in the circular economy ecosystem have come up apart from the advances by established players like **Cero & Maruti Suzuki Toyotsu India (MSTI).**

1. **Scrap Yard India**, is the first Scrap Tech Start-up solving problems in the scrap supply chain through technology.

- It provides a platform to locate and connect a vehicle owner to the registered vehicle scrap facility (RVSF/AVSF) in India, hence solving the lack of awareness part
- They provide end-to-end service from Inspection, Documentation, Picking up the vehicle, De-registration of vehicle numbers & certificate of vehicle scrapping[xxxiv].

2. **Ramky Enviro Engineers Limited (REEL)**, a leading integrated player in waste management & recycling space is to set up nationwide network of end-of-life vehicles (ELVs)[xxxv].

- REEL to partner with both automobile companies both in commercial and passenger vehicle segments
- REEL recycling facilities are being developed at locations near Delhi NCR, Mumbai, Bangalore, Hyderabad, Chennai & Adityapur as part of Phase-1
- In the next Phase, the network is expected to be expanded to 25 new locations across India

3. **Daimler India Commercial Vehicles (DICV)** has inked a strategic partnership with **Mahindra Cero**, a scrappage and steel recycling facility to help CV owners scrap their end-of-life (ELV) vehicles and replace them with new BharatBenz trucks[xxxvi].

- OEM aims to provide an end-to-end solutions for scrapping right from the process of vehicle valuation up until the receipt of CoD (Certificate of Deposit)
- Mahindra Cero is the first organized automobile recycling initiative, focused on recycling metals from ELVs by using eco-friendly methods to achieve low carbon footprint

4. **MSTC Ltd.** – A Government of India enterprise under the Ministry of Steel partnered with Mahindra Intertrade Limited (MIL) and formed a 50:50 JV named Mahindra MSTC Recycling Private Limited **(MMRPL)** to offer its customers an end-to-end solution for scrapping their vehicles[xxxvii].

- It is the first organized auto shredding plant in India for recycling ELV and other goods by converting these into shredded scrap which is a vital raw material for steel plant

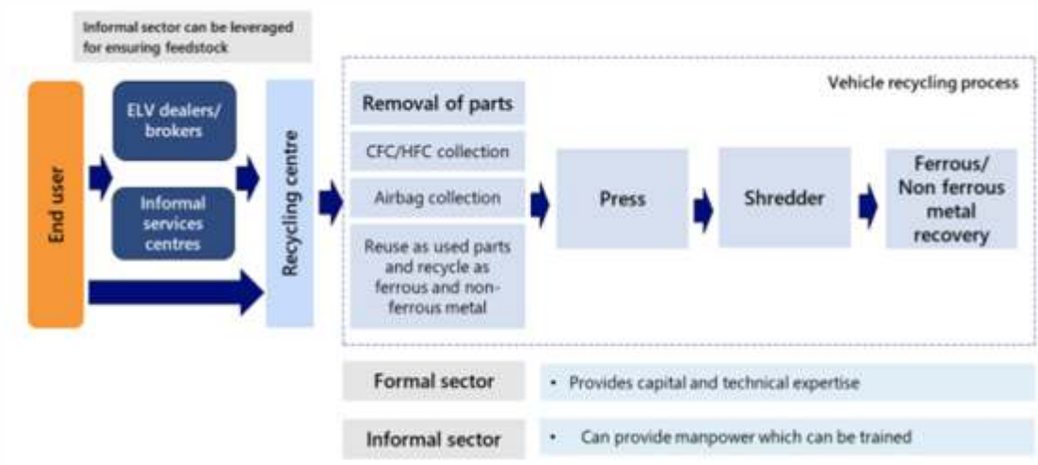
5. **Hydro** eco-design to reduce the environmental impact of products starting with material extraction, to production, transportation, usage, disposal, and recycling

- Hydro CIRCAL recycled aluminium could ensure vehicle designs made from 75% recycled aluminium, providing a sustainable alternative to traditional materials and traditional aluminium
- Hydro REDUXA low-carbon aluminium is extremely energy efficient to produce, promoting sustainable materials and design

Imperatives for ELV sector in India

The organized players can make use of unorganized players as their intermediaries and channel partners for sourcing the feedstock. It will also ensure that the livelihood of these people is secure. The years of experience in this field that lies with traditional players will avoid the need for organized players to reinvent the wheel.

The key lies in devising the right incentive structure, both monetary and non-monetary, and educating the informal sector on the benefits of this setup. If looked at from a mid-to-long term perspective, it could offer a compelling solution to the biggest problem plaguing the current recycling centres.



Source : Nomura Research Institute Consulting and Solutions India Pvt. Ltd.

Fig 7: Probable recycling setup in sustainable circular Indian economy

It is imperative that OEMs divert their CSR spending towards the training of the existing workforce in the informal sector w.r.t. the international standards and align smaller players with the new recycling policies. This will not only meet manpower requirements but will also catalyse tie-ups with the informal sector. Independent players could tie-up with OEMs to set up regional Registered Vehicle Scrappage Facilities (RVSFs) which could increase scale by aggregating partnerships with one or more OEMs e.g. a 2W maker with a PV maker.

The sector can take cues from the e-waste management segment in India, where producers, driven by government policy to collect e-waste in proportion to their production, have tied-up with e-waste aggregators and collectors in the informal sector. The informal sector collects ~ 95% of the e-waste in India, thus enabling producers to reach their collection targets. Producers in turn, apart from meeting the price requirement of individual collectors and aggregators, utilized digital payments to

alleviate concerns over security and payment risks. They also provided business development to aggregators to expand their business.

Additionally, few financial players can support the recycling industry by developing models to incentivise customers to submit ELVs and attract new entrepreneurs in the recycling ecosystem.

A strong policy mechanism, a fair incentive system, as well as strong change management, will, however, be needed to make this happen. Players that make the right moves in time, could see significant benefits accrued to them.

WAY AHEAD

It is evident that in the last couple of decades, the Indian automobile industry has witnessed rapid growth in automobiles rendering a huge number of end-of-life vehicles (ELVs). Accordingly, India has readied itself with a robust policy & regulatory framework to recycle ELVs sustainably. Though the recycling of ELVs in the country has been in the nascent stage, which struggling against numerous challenges and systemic issues.

The present assessment of existing infrastructure frameworks, together with practical solutions, revealed that the present paradigm has the potential for expediting materials recycling from ELVs and resolving the persistent issue of a recycling and circular economy in the automotive sector in India. The integration of formal and informal sectors engaged in ELV recycling in India could be critical in expanding and institutionalizing ELV recycling and conserving material and natural resources.

As per the impact assessment, the earlier, the inadequate infrastructure frameworks, policies, regulations, and inappropriate technology were critical deterrents to sustainability in recycling in India. Identification of challenges and opportunities has facilitated the finding of workable solutions to the prevailing situation.

This context paper underlines the present invigorated frameworks in terms of institutional, regulatory, and policy and focuses on the efficient ELV recycling systems in the country to foster sustainable recycling without affecting the environment and conserving natural resources. It is emphasized that apart from the integration of formal and informal ELV recyclers, formalizing sustainable ELV recycling, and generating employment, will help in reducing landfills in the country.

The context paper will also enhance the understanding and knowledge of stakeholders, including the public about the need for sustainable ELV recycling. It will also enable the government of India to adequately strengthen the present ELV recycling ecosystems, aligned with international best practices to help the auto industry in attaining ESG and SDGs 2030.

List of Tables

List of Images

Appendix

ESG – Environmental, Social, and corporate Governance

SDG – Sustainable Development Goals

HSRP – High Security Registration Number Plate

JARC – Japan Automobile Recycling Promotion Center

EU – European Union

CV – Commercial Vehicles

PV – Passenger Vehicle

EPR – Extended Producers Responsibility

SME – Small and medium-sized enterprises

NCR – National Capital Region

OEM – Original Equipment Manufacturer

CSR – Corporate social responsibility

[i] https://auto.economictimes.indiatimes.com/news/industry/vehicle-recycling-solving-challenges-by-joining-forces-with-informal-sector/91153008

[ii] https://barsleaks.com/engine/the-environmental-consequences-of-automated-fluid-leaks/

[iii] https://sciencing.com/info-8573984-effects-antifreeze-environment.html

[iv] https://iopscience.iop.org/article/10.1088/1755-1315/614/1/012083/pdf

[v] https://www.luminousindia.com/blog/post/hazards-of-lead-acid-battery-acid-spillage-contamination.html

[vi] https://www.unep.org/explore-topics/chemicals-waste/what-we-do/emerging-issues/lead-acid-batteries

[vii] https://www.ecolibrium3.org/dispose-refrigerants/

[viii] https://auto.economictimes.indiatimes.com/news/tyres/rampant-use-of-end-of-life-tyres-for-pyrolysis-in-india-atra/67941565

[ix] https://www.sciencedirect.com/topics/earth-and-planetary-sciences/scrap-tyre

[x] https://www3.weforum.org/docs/WEF_Driving_Ambitions-2022.pdf

[xi] https://www.autocarpro.in/news-national/cero-recycling-targets-more-scrapyards-for-centres-cleanup-drive-79365

[xii] https://msti.co.in/about-us.html

[xiii] https://www.autocarpro.in/news-national/maruti-suzuki-toyotsu-india-can-scrap-a-car-in-200-minutes-80509

[xiv] https://www.psmarketresearch.com/market-analysis/indian-end-of-life-vehicle-and-dismantling-market

[xv] https://evreporter.com/vehicle-scrapping-or-recycling-indian-perspective/

[xvi] https://www3.weforum.org/docs/WEF_Driving_Ambitions-2022.pdf

[xvii] https://autorecyclingworld.com/eurostat-latest-figures-for-elv-reuse-recycling-and-recovery-targets/

[xviii] Accelerated Vehicle Retirement Programs in Japan and South Korea: Background for Congress by Bill Canis, Jeanne J. Grimmet, Michaela D. Platzer, Brent D. Yacobucci

[xix] https://www.jarc.or.jp/automobile/mechanism/prevention/

[xx] https://feedbackconsulting.com/auto/environmental-impact-of-indian-elv-dismantling-practices/

[xxi] Automobile Recycling Promotion Center (jarc.or.jp)

[xxii] https://www.bmuv.de/en/topics/water-resources-waste/circular-economy/types-of-waste-waste-flows/end-of-life-vehicles/legislation-in-germany-end-of-life-vehicle-ordinance#c24596

[xxiii] https://www.bmuv.de/en/topics/water-resources-waste/circular-economy/types-of-waste-waste-flows/end-of-life-vehicles/legislation-in-germany-end-of-life-vehicle-ordinance#c24596

[xxiv] https://www.fortum.com/media/2022/09/fortum-start-battery-recycling-operations-germany-serving-european-ev-automotive-industrys-rising-demand-battery-raw-materials

[xxv] https://evreporter.com/vehicle-scrapping-or-recycling-indian-perspective/

[xxvi] https://eu.boell.org/en/end-of-life-vehicles-final-destination

[xxvii] https://morth.nic.in/sites/default/files/VVMP-Investor-Handbook.pdf

[xxviii] VVMP- Investor handbook

[xxix] https://auto.economictimes.indiatimes.com/news/what-will-be-the-impact-of-scrappage-policy-on-indias-ev-market/83539997

[xxx] https://timesofindia.indiatimes.com/business/india-business/vehicle-scrappage-policy-details-benefits-rules-and-more/articleshow/85309762.cms

[xxxi] From AIS - 129 Provision for end of life vehicles Guidelines

[xxxii] https://recykal.com/2022/07/14/epr-in-india/

[xxxiii] https://autorecyclingworld.com/india-is-moving-towards-an-epr-scheme-for-waste-tyres/#:~:text=%27Extended%20Producer%20Responsibility%27%20means%20the,tyre%27%20means%20taking%20all%20steps

[xxxiv] https://scrapyardindia.com/

[xxxv] https://www.thehindubusinessline.com/companies/ramky-enviro-to-set-up-nation-wide-network-of-end-of-life-vehicle-recycling-facilities/article34754070.ece

[xxxvi] https://www.autocarpro.in/news-national/dicv-partners-mahindra-cero-for-endoflife-cv-scrapping-81172

[xxxvii] https://www.mstcindia.co.in/content/ScrapYourJunk.aspx

NOTES

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Building the Nation, Responsibly.

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