DISCUSSION PAPER

National Transport Decarbonization Council

VEHICLE SCRAPPAGE POLICY

THE ENERGY AND RESOURCES INSTITUTE

Creating Innovative Solutions for a Sustainable Future

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About National Transport Decarbonization Council

The Intergovernmental Panel on Climate Change (IPCC) reports a serious need to implement transport decarbonization policies in India. The responsibilities to draft and implement the decarbonization policy fall under the various ministries of the central government. An effective decarbonization policy requires collaboration between various central ministries, civil societies, activists, industry, technology providers, and research organizations. The need of the National Transport Decarbonization Council (NTDC) is to bring all the stakeholders to a single platform.

Role of the Council

To develop a common understanding of the transport decarbonization measures and build consensus among all policymakers at various levels. Under the guidance of the council, three theme-based workshops on key issues in the transport sector were organized to discuss the pivot issues and challenges in achieving the decarbonization and formulating the various strategies. The deliverables also include the preparation of a discussion paper on each of the themes.

The themes identified for the study are:

1. Vehicle Scrappage Policy
2. Emission Reduction and Efficiency Improvement

   Part A: CO_2 emission reduction through fuel efficiency improvement

   Part B: Future road map for tightening emission standards
3. Biodiesel as Fuel

This discussion paper is on the first theme – Vehicle Scrappage Policy.

To know more about NTDC: https://www.teriin.org/project/national-transport-decarbonization-council

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List of Abbreviations

AIS-129	Automotive Industry Standard-129
ASR	Automotive Shredder Residue
ATS	Automated Testing Station
BS	Bharat Stage
CPCB	Central Pollution Control Board
ELV	End-of-Life Vehicle
EU	European Union
HDV	Heavy Duty Vehicle
I&M	Inspection and Maintenance
MoEFCC	Ministry of Environment, Forest and Climate Change
MoRTH	Ministry of Road Transport and Highways
NOx	Nitrogen Oxides
OEM	Original Equipment Manufacturers
PM	Particulate Matter
PUCC	Pollution Under Control Certificate
RVSF	Registered Vehicle Scrapping Facility
SGST	State Goods and Services Tax

Glossary

Automotive shredder residue	A by-product of ELV recycling, after removal of all liquids and hazardous components from an ELV and shredding of the hulk
Automated testing station	Stations where vehicle fitness testing is conducted through automated vehicle testing equipment authorized by state governments
Certificate of deposit	Certificate issued by registered vehicle scrapping facility to recognize the transfer of ownership of vehicle from registered owner to registered scrapper for further treatment
Depollution	Depollution includes removal of hazardous components such as battery, fluids, airbags, any part containing mercury, etc.
End-of-life vehicle	All vehicles that are no longer validly registered or declared unfit through automated fitness centres or registrations have been cancelled or self-declared by registered owner as a waste vehicle under specified circumstances
Registered vehicle scrapping facility	Any establishment with a registration for vehicle scrapping for carrying out dismantling and scrapping operations

1. Background

Globally automobile industry has one of most high rates of raw material consumption and pollution during manufacturing as well as produces immense environmental impact in the form of emissions and waste generation in post consumption stages (Nunes and Bennett, 2008). This resource demand has increased as a result of the massive rise in automobile ownership with over 72 million vehicles sold globally in 2021 (OICA statistics, 2022).

India's rapid economic growth has caused a growing demand for both passenger and freight mobility and is expected to continuously increase (Bansal and Bandivadekar, 2013). As a result, the reliance on imported fossil fuels and correspondingly the related emissions from vehicles have also increased. The percentage share of emissions from the transport sector in total carbon emissions is likely to increase from 13.5% to 19% by 2050 (TERI, 2021). The transport sector is the third-highest emitting sector and 90% of transport emissions is contributed by road transport (CSE, 2021). From 2009–2019, the number of registered vehicles in India has grown annually by 10%, with a total of 304.8 million registered vehicles in 2022.

With the increasing rate of registered vehicles, the number of vehicles becoming old and obsolete will also increase. The average life of a vehicle is considered to be 10–15 years depending on the usage condition (Arora et al., 2018). Indian vehicle owners tend to continue usage beyond the expected life of vehicles which have higher emissions, lower fuel efficiencies, and lower safety

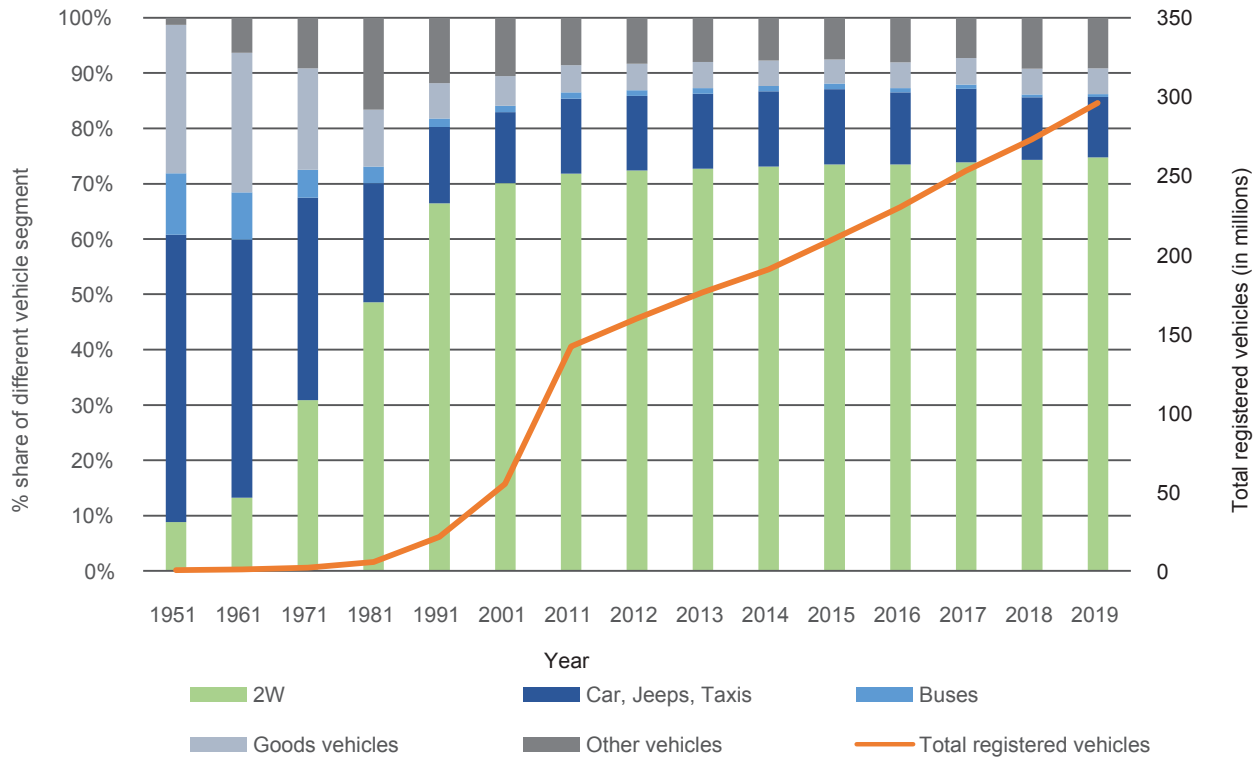

Figure 1: Number of registered vehicles in India based on vehicle segment

Source: Ministry of Road Transport and Highways[2] and TERI Analysis

1 Details available at https://vahan.parivahan.gov.in/vahan4dashboard/

2 Road Transport Yearbook 2017-18 & 2018-19. Details available at https://morth.nic.in/sites/default/files/RTYB-2017-18-2018-19.pdf

standards (AIS-129, 2015). It was estimated that more than 8.7 million end-of-life vehicles (ELVs) were present in 2015 and expected to increase to 21.8 million by 2025 (CPCB & GIZ, 2015), which would be required to be scrapped. In 2021, the Ministry of Environment, Forest and Climate Change (MoEFCC) specified that 21.4 million vehicles exist in India that are older than 20 years. Nationally, the vehicle registration database is cumulative and not revised either after vehicles retire or are scrapped, which has made exact quantification of the ELVs difficult.

There is a direct relationship between vehicular retail and ELV generation as the present vehicles will generate ELVs in the future. The number of ELVs were observed to follow a linear trend, on a similar trend the 2.8 million ELVs were projected to be added each year as shown in figure 2 and a total of 46.8 million ELVs by 2030 (Annexure A).

The objective of this discussion paper is look at the current scenario and policy landscape and the associated challenges in India. The paper gives recommendations based on international experiences and derived learnings from various stakeholder consultations.

1.1 Vehicular emissions from ELVs

In Indian cities, prolonged exposure to air pollution has become one of the major causes of health problems (Pini et al., 2021). In 2015, premature deaths from ambient particulate matter (PM) pollution cost 10.6% of the Indian GDP. Some of the factors for rising air pollution are increasing vehicle ownership, the presence of ELVs, and inadequate maintenance leading to inefficiencies of these ELVs (Kebede et al., 2022). Since 2021, It is estimated that 32,000 lives were lost due to PM2.5 air pollution and costing the national capital US $4.8 billion (till September 2022).[3]

Older vehicles contribute significantly to vehicular emissions. Heavy-duty vehicles (HDVs), which are primarily diesel vehicles, substantially emit nitrogen oxides (NOx), sulphur oxides (SOx), and PM while gasoline vehicles emit carbon monoxide (CO) and hydrocarbon (HC) (Ventura et al., 2020). Accordingly, fleet renewal is important and new vehicle standards would aid in reducing vehicular emissions.

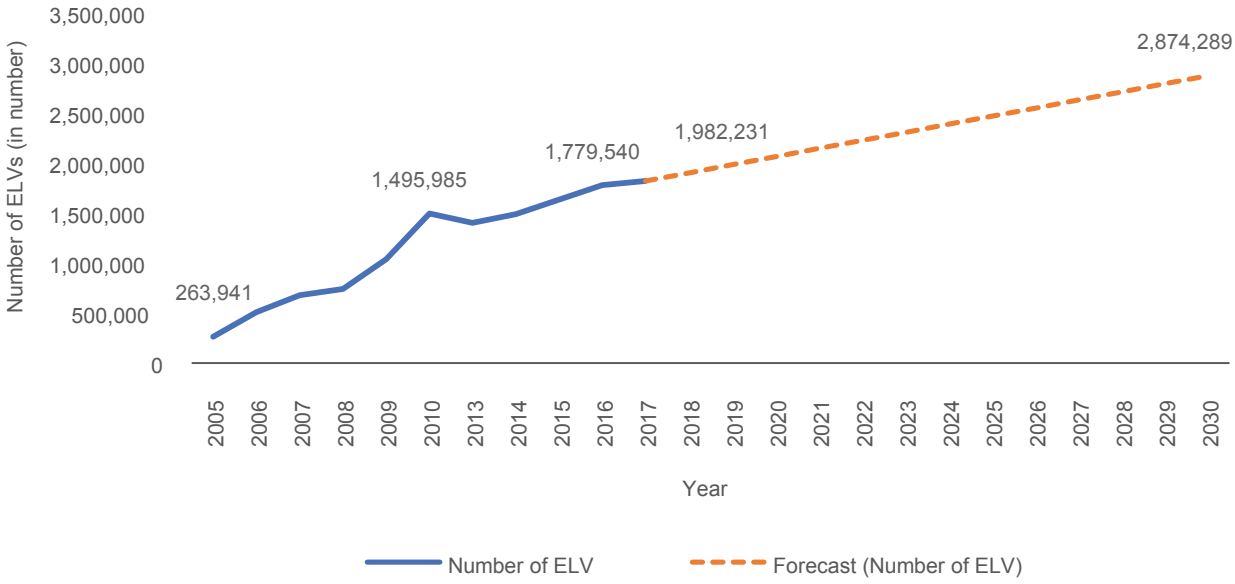

Figure 2: Projected number of end-of-life vehicles

Source: TERI Analysis

3 Clean Air Counter - Greenpeace International, 2022. Details available at https://www.greenpeace.org/international/campaign/tracking-cost-air-pollution/

Many studies indicate that old vehicles' impact on air quality is high because of the contribution to the pollution concentration and, therefore, needs mitigation.

Studies for specific countries indicate older vehicles comprise many inefficiencies associated with safety and pollution (Arora et al., 2021). A study stated that a 15-year-old diesel car emits 7.6 times higher PM and 3.4 times higher NOx than a BS-IV car (Chowdhury and Chattopadhyaya, 2020). It is estimated that there is a reduction of 17% in CO_2 emissions, 18% in HC and NO_x emissions, and 24% in PM emissions if older trucks and buses are scrapped (Arora et al., 2018). Three per cent of HDVs in the vehicle fleet contribute to more than 55% of black carbon, 60% of PM, and 70% of NO_x emissions and the majority of the emissions are from more than 10-year-old HDVs (Shao et al., 2016). Another study quantified that the commercial vehicle fleet that was manufactured before 2000 constitutes less than 1% of commercial vehicles but contributes 23% of the total PM emissions (Sharma et al., 2020).

1.2 Resource efficiency

The main sources of solid waste in terms of both volume and growth rate, after municipal solid waste, are ELVs and waste electrical and electronic equipment (Sharma and Pandey, 2020). As a result, the concern for sustainable management of ELVs has arisen globally. ELVs contain hazardous substances such as waste oil, airbags, lubricants, electronic components, etc. (Arora et al., 2021), which cause environmental contamination, if improperly disposed.

Recycling one tonne of steel conserves consumption of 1.4 tonnes of iron ore, 740 kg of coal, and 120 kg of limestone (Shanmugam et al., 2021). This can potentially reduce the instabilities in raw material supply for manufacturing new vehicles with fewer supply constraints. There will be an associated reduction in costs linked to less extraction of raw material.

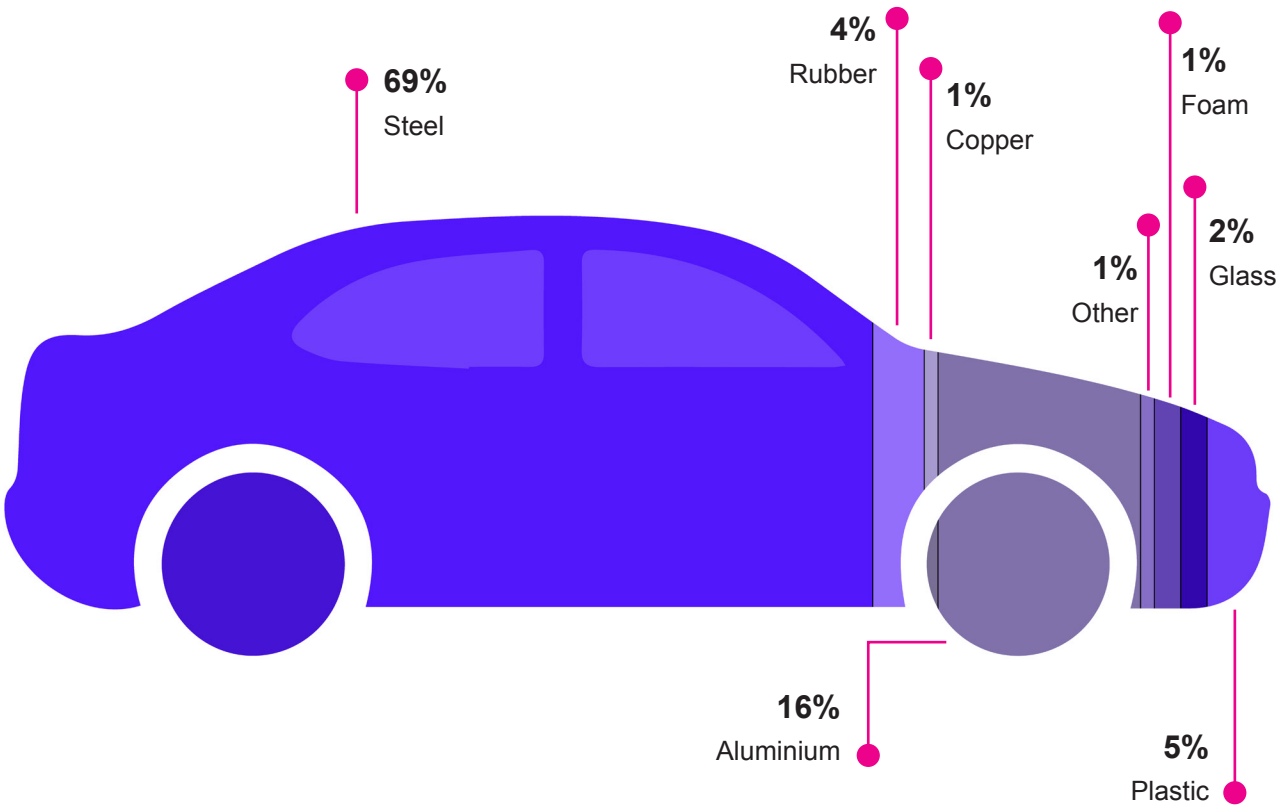

Figure 3: Percentage of materials used in a passenger car

Source: TERI, 2017

ELVs can be considered a potential secondary resource stream, which can minimize the trade-off between growth and environmental well-being, by enhancing resource efficiency and circular economy as more than 70% of a vehicle can be dismantled and reused (Buberger et al., 2022).

The reuse/recycling process will also reduce the vehicle's life cycle emissions (Buberger et al., 2022). Recycling of a typical Indian car can prevent 1.6 tonnes of greenhouse gases and avoid mining of 0.22 million tonnes of bauxite for manufacturing aluminium (Sharma and Pandey, 2020).

An average passenger car constitutes about 69% of steel of the weight of the vehicle, 16% aluminium, 5% plastic, 4% rubber, and the rest are foam, copper, glass, etc. (TERI, 2017). Thirteen different polymers are used in a single car but 66% of the total plastics used are namely polypropylene (32%), polyurethane (17%), and PVC (16%) (Patil et al., 2017). Two-thirds of the fuel consumption is attributed to the weight of the vehicle, therefore, a reduction in the usage of ferrous materials has been observed. Lightweight materials like aluminium, plastics, and composites are increasingly being used to reduce the weight of the vehicle. The average plastic penetration in India is 60 kg/vehicle, which is half of the average global plastic penetration.

India imported ₹45,694 billion worth of waste and scrap of stainless steel during 2021–2022 (Ministry of Commerce and Industry, 2022) and is facing high resource extraction pressure at 3902 tonne/hectare compared to 1122 tonne/hectare globally (Kebede et al., 2022). Currently, the scrapping of ELVs is not adequate to recover materials for sustainable resource circulation. But estimates suggest that ELVs can generate ₹115 billion worth of steel scrap (Arora et al., 2018).

ELVs contain materials that can be salvaged and, if effectively recycled, can be fed back into the supply chain, which will reduce the environmental impacts arising from the mining of primary materials. To mitigate the emission and recover valuable materials, safe and regulated scrapping of ELVs is necessary and it is important to scrap the ELVs in an environmentally safe process.

2. Introduction

In the 1990s, emissions from older vehicles emerged as an issue in various cities; despite their relatively small numbers the contribution to pollution was significant. The increasing fleet age and higher emissions concerned the regulators and elected representatives implementing new mandates such as the Clean Air Act Amendments in 1990, and private organizations advocated a market-based approach to control air pollution (Dill, 2004). These factors led to the voluntary accelerated vehicle retirement programme. The programme offered vehicle owners a fiscal incentive for scrapping the vehicles with the overall aim of air pollution reduction by the removal of older and polluting vehicles earlier than normal.

Vehicle scrappage policies by governments globally have outlined the elimination of end-of-life higher-emitting vehicles and replacement with lower-emitting vehicles. For an effective fleet modernization programme, it should be on an accelerated basis to make provisions for scrapping higher-emitting vehicle fleets, including trucks and buses (Lathia and Dadhaniya, 2019). Threefold objectives of reduction in on-road emissions, transition to better emission standard vehicles, and close monitoring of the in-use vehicle fleet can be achieved from vehicle scrappage policies.

2.1 Current scenario

End-of-life vehicle in India is defined as a vehicle which is no longer validly registered, declared unfit through automated fitness centres, or self-declared by the owner as a waste vehicle.[4] At present, most automobile scrapping centres are managed by the informal sector. Informal recyclers practise crude methods to recover components and materials and are organized among each other and stakeholders of the ELV value chain (Sharma and Pandey, 2020). They pose many challenges such as lack of regulations, no depollution process followed, lack of infrastructure and hazardous waste handling, downcycling of material, etc.

For testing of vehicles, no automated testing station (ATS) is functional as per Central Motor Vehicles (21st Amendment) Rules, 2021.[6] The Ministry of Road Transport and Highways (MoRTH), the nodal agency, has set up one model inspection and certification (I&C) centre in each of the 27 States/UTs.[6] Fees for re-registration, conducting fitness tests, and granting fitness certificates have been increased. Six vehicle scrapping centres - three in Delhi-NCR, two in Gujarat, and one in Haryana are functional.[6] Seven more functional vehicle scrapping centres have applied for registration with respective states and six states

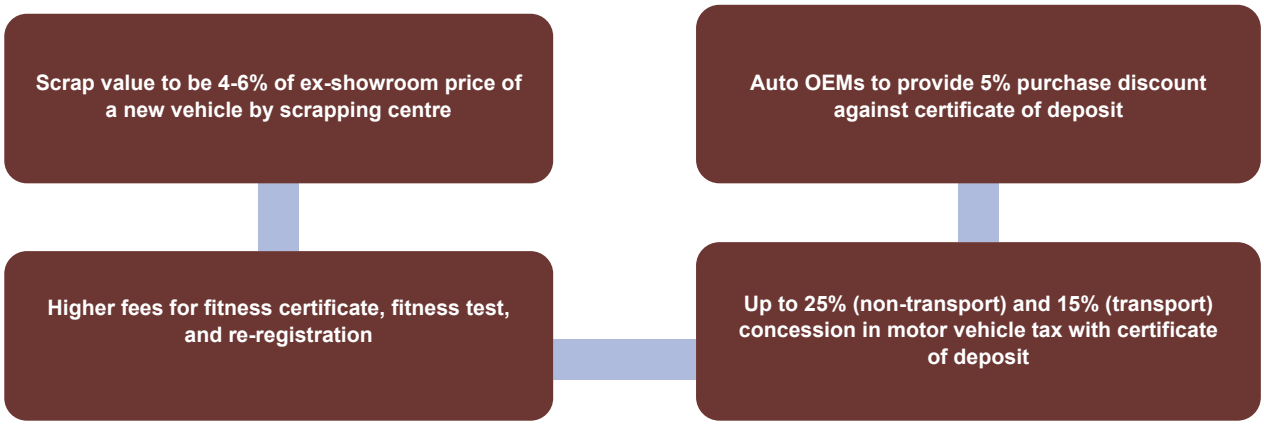

Figure 4: Current incentives and disincentives in the policy[5]

Source: Based on the Vehicle Scrappage Policy

4 Details available at https://morth.nic.in/sites/default/files/notifications_document/GSR%20653.pdf

5 Transport vehicle means a public service vehicle or a goods vehicle.
Non-transport vehicle means a motor vehicle which is not a transport vehicle that includes two-wheelers, cars, jeeps, omnibuses, tractors, trailers, etc.

6 Details available at https://rajyasabha.nic.in/Questions/QuestionTypeWiseSearch

Figure 5: Major informal scrapping units in India

Source: TERI's compilation

have approved 20 applications for the establishment of Registered Vehicle Scrapping Facility (RVSF).[6]

2.2 Process

In this section, we explore the general scrappage process adopted by most dismantling and recycling units.

Deregistration of ELVs

The process involves the last owner handing over the ELV to a vehicle scrapping facility with proper documentation of ownership. The owner will get an end-of-life value, i.e., the value of an ELV given for scrappage. The facility shall assist the owner in the online deregistration process through the VAHAN portal by MoRTH and clear the records of the ELV for scrapping. The online deregistration portal has been set up with the collaboration of National Crime Records Bureau (NCRB) to aid vehicle owners to verify and deregister their vehicles. The central government portal is being integrated with the state governments' portals to ensure a smooth deregistration process for the owners. This database will also assist in keeping a check on the misuse of stolen vehicles for scrapping.

Depollution: The scrappage centre starts with depollution, i.e., removing the hazardous materials such as radiator coolant, engine and transmission oils, and AC gas that are used in the vehicles, which is important for further ELV processing.

Dismantling: Once the vehicle is depolluted, the exterior and interior parts are dismantled and then segregated components are sent to recycling agents. Considering Indian conditions with cheap labour, extensive dismantling is carried out instead of shredding.

Shredding: Commonly, shredding of the remaining body is carried out for further processing. But the equipment required is capital and energy intensive and suitable for large volume of ELV handling. The automotive shredder residue (ASR) is a highly heterogeneous mixture of residual ferrous and non-ferrous metals (5–23%), plastics (20–49%), rubber (3–38%), textile and fibre material (4–45%), wood (2–5%), and glass (2–18%) (Yi and Park, 2015), which depends upon the ELVs and level of dismantling before shredding. Heavy ASR is molten for recovering non-ferrous metals such as aluminium and copper. However, some components such as ash and heavy metals are difficult to separate, therefore, ASR is either used for energy recovery or sent directly to landfills.

After dismantling and recovering of components, the remaining part, car hulk, is compressed and flattened and/or sent to a shredder depending on recyclers' requirement. The vehicle body frame is processed into a bale and sent to recyclers.

MoRTH has been closely working with States/ UTs governments for nationwide policy implementation and establishment of the ATS for vehicles and scrapping of ELVs in an environmentally friendly manner and through a scientific process by RVSFs as envisaged in the policy.

-MoRTH

2.3 Extended Producers' Responsibility (EPR)

Extended Producers' Responsibility is defined as the principle by which the upstream actors, i.e., manufacturers are made responsible for the waste generated even in the downstream activities with a focus on recycling or disposal of the product (Bhadra and Mishra, 2020). This can trigger a change in the overall ELV management which is currently dealt by the informal sector. The maximum benefits of EPR can be achieved with both downstream improvements in the promotion of separate collection and recycling as well as upstream improvements in prompting material efficiency and cleaner technologies (Compagoni, 2022).

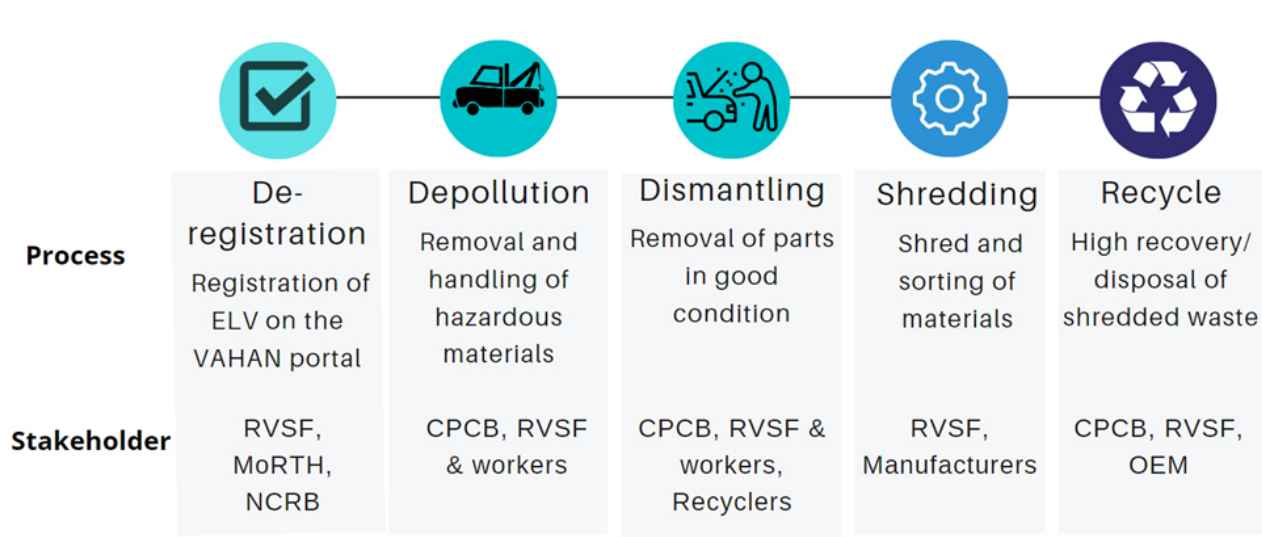

Figure 6: Common process followed for an ELV[7]

Source: TERI's compilation based on processes followed globally

7 The process of shredding is not followed in India

The automobile sector requires establishing circularity to ensure the greening of the supply of raw materials. Through Extended Producers' Responsibility (EPR), better value can be realized from end-of-life vehicles (ELVs) and should be introduced immediately on vehicles being sold now.

-TERI

The development of a formal collection process by OEMs will have the following cascading downstream results:

- An increase in the collection rate of ELVs, which translates to better recovery and recycling.
- This will reduce externalities generated by improper ELV disposal and dumping of waste liquids and gases by the informal sector.
- Increased stable flow and recovery rate would lead to the growth of the secondary raw materials market.

By making OEMs economically and physically responsible for ELVs, it will incentivize cleaner production, the design aimed at maximum recovery, and strategies to decrease the costs and increase the efficiency of the recovery process (Compagnoni, 2022). EPR can establish a self-sustainable ecosystem promoting circular economy where OEMs are responsible for its disposal. This will encourage secondary resource material back into production cycle from ELV to the OEMs and their ancillaries, especially when resource extraction pressure in India is high. It will also lead to a reduction of hazardous and pollutant substances, which are difficult to handle such as Freon gas as suggested by the RVSF.

In the EU, recycling of ELVs is organized under EPR legislation and accordingly manufacturers are held responsible for take-back of ELVs, increasing recyclability of vehicles, and disseminating information on dismantling procedures. Nissan, since 2005, has achieved a 95% or greater recyclability rate in all new models launched in the Japanese and European markets. Similarly, Maruti has achieved a minimum of 85% recyclability and 95% recoverability for all running models.[8]

Vehicle manufacturers need to take responsibility for end-of-life vehicles. Through research and development, they can develop pilot models that other manufacturers can replicate and indigenize the global methods for the Indian market.

-GIZ

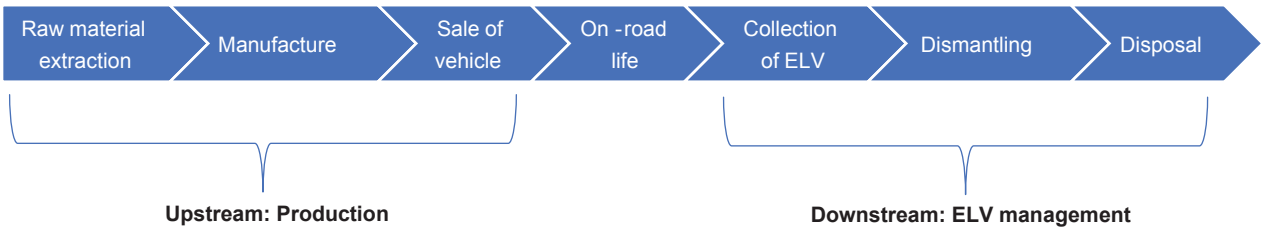

Figure 7: Life cycle of a vehicle

Source: Compagnoni, 2022

8 Details available at https://marutistoragenew.blob.core.windows.net/msilintiwebpdf/Maruti_IR_2021-22.pdf

3. Policy Landscape of Scrappage in India

3.1 Central policies

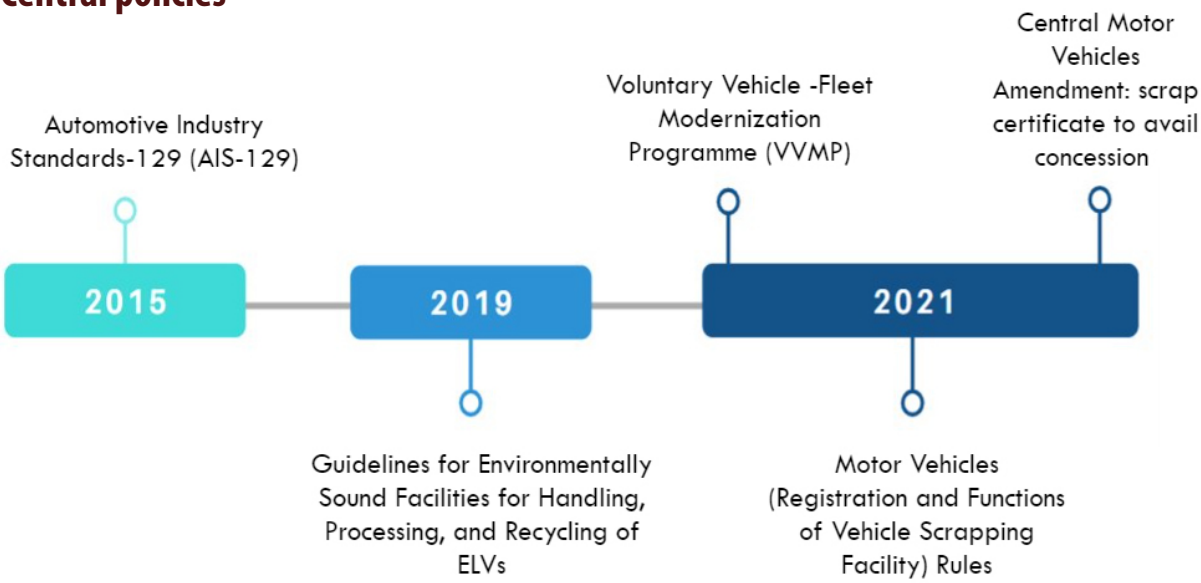

Figure 8: Timeline of policies in India

Source: TERI's compilation

3.1.1 Automotive Industry Standard–129

The Automotive Industry Standard–129 (AIS-129) on End-of-Life Vehicles was framed in 2015 as a step towards an organized and environment-friendly automobile recycling sector. AIS-129 places requirements for the collection and dismantling centres and vehicle manufacturers to comply with the reusability, recyclability, and recoverability (RRR) calculations, restrict usage of heavy metals in manufacturing, and provide dismantling information to authorized collection and dismantling centres. The standard requires vehicles to be reusable and/or recyclable to a minimum of 80% by mass and reusable and/or recoverable to a minimum of 85% by mass. It restricts usage of heavy metals including lead, mercury, hexavalent chromium, etc., and instructs plastics to be appropriately coded to inform dismantlers. AIS-129 stipulates that the five functional assemblies, i.e., the engine, power transmission box, steering, axle, and chassis of the ELV must be sold as recycled materials and trading as second-hand parts are forbidden. However, AIS-129 is still not mandated.

3.1.2 Guidelines for Environmentally Sound Facilities for Handling, Processing and Recycling of End-of-Life Vehicles (ELV), 2019

The Guidelines[10] compile environmentally sound strategies for handling, storage, transportation, and de-pollution of ELVs. It further mentions procedures for removal of common hazardous substances, environmentally sound dismantling & segregation and shredding, separation, and processing of residues of ELVs. There are remarks on ELV recycling technologies, recycling facilities set-up requirements, and waste management during depollution or dismantling of ELVs. In terms of material efficiency in the waste management hierarchy,

9 Details available at https://hmr.araiindia.com/Control/AIS/35201550654PMAIS-129_F.pdf
10 Details available at https://cpcb.nic.in/uploads/hwmd/Guidelines_Handling_Processing_and_Recycling_ELV_11.03.2019.pdf

the guidelines highlight reuse is better than recycling. And another major issue in cities is the requirement of land parcel for setting up ELV dismantling, which is difficult and costly.

3.1.3 Draft guidelines for imposition of Green Tax

Less than 1% vehicle fleet manufactured before 2000 pollutes 10–25 times more than modern vehicles, which creates a negative externality borne by society. Hence, the levy of green tax on usage of old vehicles intends to discourage over usage of these vehicles. It is in line with the principle of polluters must pay by imposing the economic cost of pollution and motivating them to switch to cleaner vehicles. The levying of such green tax is not uniform across the country as it depends on each state government prerogative (see Annexure B).

3.1.4 Motor Vehicles (Registration and Functions of Vehicle Scrapping Facility) Rules, 2021

MoRTH came up with the draft guidelines for setting up, authorization and operating of Authorised Vehicle Scrapping Facility (AVSF) for safe and regulated disposal of vehicles. It will promote a legally compliant vehicle dismantling and scrapping industry in the country. The guidelines were revised and Motor Vehicles (Registration and Functions of Vehicle Scrapping Facility) Rules, 2021[11]

Figure 9: States/UTs implementing Green Tax (as of 2022)

Source: TERI's compilation

11 Details available at https://morth.nic.in/sites/default/files/notifications_document/GSR%20653.pdf

came into force on September 25, 2021. It explicates the eligibility, registration process, and procedures to be followed for setting up the RVSF.

The Central Motor Vehicles (Twenty Third Amendment) Rules incorporate an upward revision of registration, fitness testing, and fitness certification fee for vehicles and the Twenty-fourth Amendment provides for a certificate of deposit of vehicle scrapping to avail concession up to 25% for non-transport vehicles and 15% for transport vehicles. However, it is available on purchase of any vehicle and no environmental compliance standards for the new vehicle are specified.

Vehicle Scrapping Policy is voluntary and based on the fitness of the vehicle. It is not based upon the vintage or the kilometres covered by the vehicle.

-MoRTH

3.1.5 Recognition, Regulation & Control of Automated Testing Stations Rules[12]

Automated testing stations (ATS) authorized by the state governments conduct vehicle fitness tests through automated vehicle testing equipment. The appointment for the fitness test is booked along with depositing fees, essential documents, and other details from the VAHAN database. The vehicle that fails any or all of the required tests can apply for a retest within thirty days of the result, after rectification of the defects specified in the initial inspection. An appeal within seven days of the result can also be filed. The vehicle on clearing a fitness test is issued a certificate of fitness.

Table 1: Summary of existing policies in India

Timeline	Policy/Rule	Outline	Current Status
March 2015	Automotive Industry Standards-129 (AIS-129) on End-of-life vehicles	Guidelines for ELVs for organized and environment-friendly automobile recycling sector	Standard Not notified
January 2019	Guidelines for Environmentally Sound Facilities for Handling, Processing and Recycling of End-of-life vehicles	Management of ELVs including collection, transportation, storage, processing and channelizing waste generated to recycling/waste disposal facilities	Guidelines Not notified
October 2019	Guidelines for Setting up, Authorization, and Operation of Authorized Vehicle Scrapping Facility (AVSF)	For safe and regulated disposal of vehicles and promotion of legally compliant vehicle scrapping industry	Draft notification
February 2021	Draft Guidelines for Imposition of Green Tax	Tax on the old vehicles to discourage over usage	Draft Notification
September 2021	Recognition, Regulation & Control of Automated Testing Stations Rules	Rules for recognition, regulation and control of automated testing stations	Notified G.S.R. 652 (E)
September 2021	Motor Vehicles (Registration and Functions of Vehicle Scrapping Facility) Rules, 2021	To establish Registered Vehicle Scrapping Facility (RVSF) throughout the country	Notified G.S.R. 653(E)
2021	Voluntary Vehicle Fleet Modernization Programme	Owners to deregister private vehicles >20 years and commercial vehicles >15 years if failing mandatory fitness tests	Not Notified

Source: TERI's compilation based on various policies

12 Details available at https://morth.nic.in/sites/default/files/notifications_document/GSR%20652.pdf

3.1.6 Voluntary Vehicle Fleet Modernization Programme

The voluntary vehicle-fleet modernization programme (VVMP)[13] was first announced in the Union budget for 2021–2022 to phase out unfit and polluting vehicle fleets. On August 13, 2021, the central government launched VVMP with an emphasis on waste-to-wealth to promote a circular economy. The target is to reduce India's oil import bills by the usage of fuel-efficient vehicles, reduction in environmental pollution, and improvement in road and vehicular safety by removing defective vehicles and boosting the availability of raw materials like plastic, steel, aluminium, rubber, etc.

The programme aims phased scrapping of government and public sector units (PSU) vehicles older than 15 years beginning April 1, 2022. The heavy commercial vehicles will be subjected to mandatory fitness testing from April 1, 2023, and similarly in a phased manner for other categories from June 1, 2024.

3.2 State-wise policies

In Delhi, in line with the Supreme Court and National Green Tribunal (NGT) rulings about rising air pollution, the state government introduced the Delhi Scrappage Policy in 2018, the first state to introduce a scrappage policy. With other NGT rulings, state pollution control boards in coordination with various agencies/organizations implement the air pollution control action plan. Few cities in India have implemented the provisions of scrappage after NGT rulings.

Table 2: Scrappage policies and air pollution action plans in the Indian cities/states

Timeline	State	Aim	Measures taken
August 2018	Delhi[14]	Scrap 10-year-old diesel vehicles and 15-year-old petrol vehicles	Up to 25% rebate on road tax with vehicle scrapping certificate
December 2018	Ahmedabad, Gujarat[15]	Air information and response	Strict vigilance and stop plying of visibly polluting vehicles by impounding or heavy fine (when AQI >301)
December 2018	Kolkata, West Bengal[16]	Air pollution Control	• Phasing out/scrapping >15-year old commercial vehicles based on Eastern Bench of NGT • Only 4-Stroke LPG 3-wheelers allowed
February 2019	Kohima, Nagaland[17]	Air quality monitoring	• Phasing out 15-year-old commercial diesel vehicles • Regular checking of vehicular emission and issue of PUCC
September 2019	Mumbai, Maharashtra[18]	Action Plan for Control of Air Pollution	• BS-II and BS-III bus scrapping policy developed • Restrict 20-year taxis and 16-year auto-rickshaws
October 2021	Gujarat	Reduce vehicular pollution, improve road and vehicular safety, better fuel efficiency	
2022	Uttar Pradesh	Implement Central Scrappage Policy	State government- pay 6% of scrap value + 5% purchase discount, 25% tax exemption with scrapping certificate
December 2022	Odisha[19]	Improve air quality, regularize informal facilities, and promote circular economy	• Vehicles >15 years banned in low emission zones • Incentives to customers • Land incentives, capital investment subsidy, SGST reimbursement to RVSFs

Source: TERI compilation

13 Details available at https://morth.nic.in/sites/default/files/VVMP-Investor-Handbook.pdf
14 Details available at https://transport.delhi.gov.in/sites/default/files/All-PDF/Guidelines%2Bfor%2Bscrapping%2Bof%2Bvehicles.pdf
15 Details available at https://www.nrdc.org/sites/default/files/air_plan_2018_dec3_v2.pdf
16 Details available at https://cpcb.nic.in/Actionplan/West%20Bengal.pdf
17 Details available at https://cpcb.nic.in/Actionplan/Kohima.pdf
18 Details available at https://cpcb.nic.in/Actionplan/Mumbai.pdf
19 Details available at http://odishatransport.gov.in/Application/uploadDocuments/Notification/document_0_1669978252.pdf

4. Global Practices on Vehicle Scrappage

In the 1990s, the Clean Air Act Amendments and other mandates were implemented in response to the growing fleet age and increased emissions, and commercial organizations promoted a market-based strategy to reduce air pollution. The voluntary accelerated vehicle retirement programmes were the result of these causes (Dill, 2004). With the goal of reducing air pollution, these schemes provide vehicle owners with a financial incentive to scrap their vehicles.

Globally, ELV generation is estimated to be 40 million ELV/year; this accounts for 4% of total global automobile ownership (CPCB guidelines, 2019). Most vehicle scrappage policies were introduced around the globe in 2009, and the majority were aimed at providing support to the automotive industry. Most of these programmes were designed as cash for the replacement of an ELV, which provided a conditional bonus on a new and more fuel-efficient model. However, in some countries, incentives were for scrappage without imposition on the age of the ELV or an obligation to purchase a new vehicle. These programmes had a limited tenure and were to revive the industry in a short term.

4.1 Canada

The National Vehicle Scrappage Programme was launched in January 2009 aiming to remove vehicles older than the 1995 model. It was also called Retire your Ride,[20] which had provisions in the 2007 Federal Budget with targeted investments for climate change mitigation. The programme aimed to remove on-road high polluting vehicles and reduction in greenhouse gas emissions by adoption of sustainable transportation and vehicle recycling best practices. The government operated the programme and partnered with a non-profit organization. However, the first programme was at the provincial level in British Columbia called the Scrap-It programme in April 1996. Since then, various provinces have followed the suit.

It was estimated in 2007 that there were approximately 4.6 million vehicles older than the 1995 model in Canada, which were 19 times more polluting than the 2004 model year vehicles (Shaikh, 2020). The cash incentive for scrapping an ELV was $300. Additionally, to purchase rebates, incentives included transit passes, memberships in car-sharing programmes, and discounts on bicycles

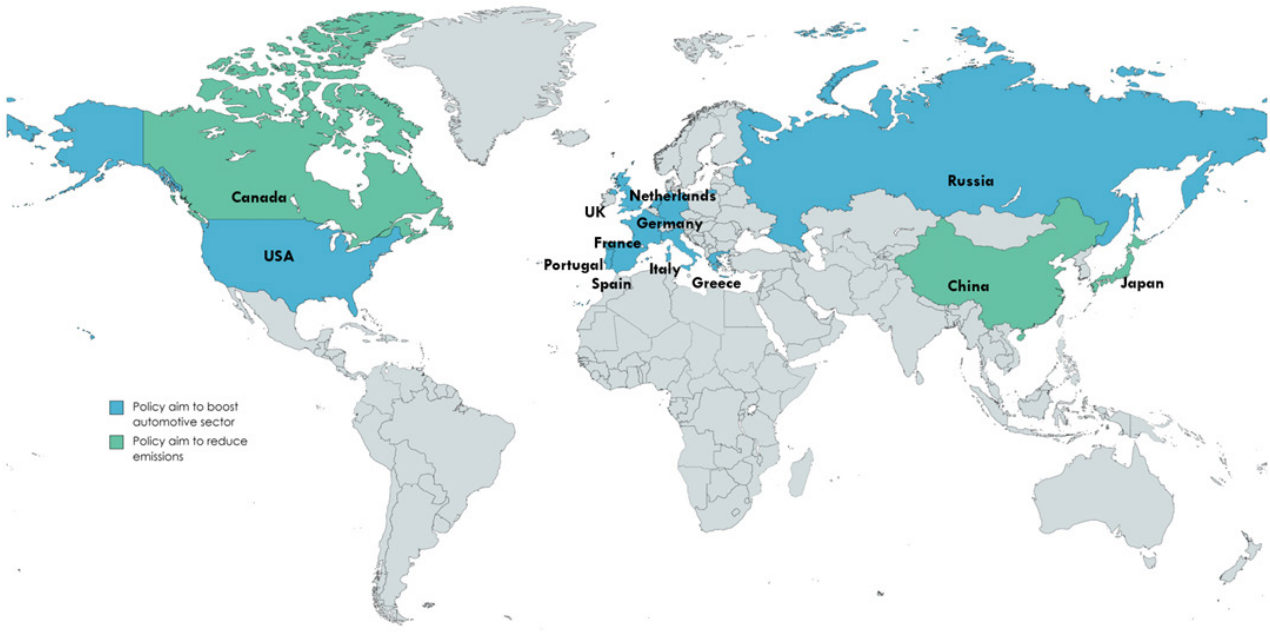

Figure 10: Countries that implemented vehicle scrappage policy in 2009

Source: TERI Analysis based on global policies

20 Details available at https://retireyourride.ca/

and e-bikes. The programme ended on March 2011 and removed a total of 138,600 vehicles from the road.

4.2 China

In July 2009, the government announced the Measures for the Administration of Automobile Replacement. China's focus was to control pollution, therefore, incentives up to RMB 6000 for buying new cars and trucks were offered. However, there were limited incentives in the initial months, which were later taken up by the local authorities with increased incentives of RMB 18,000 to offset the benefits from the resale values of old cars. The policy highlighted only the disposal of yellow-label (below China 1 Emission Standard) vehicles to certified auto-products recycling companies and buying a new vehicle would receive incentives. To support the automotive sector, the subsidy programme has been extended for battery electric vehicles and plug-in hybrid electric vehicles in 2022. The Zhongshan municipal government announced cash subsidies of RMB 3,000 for the purchase of China 6 emission standard vehicles. The subsidies for older vehicle owners are the largest component of the cost of eliminating and scrapping old vehicles borne by the government (Zhou, et al., 2019).

4.3 European Union (EU)

In 2000, EU-Directive 2000/53/EC[21] on ELVs stated that by 2006 EU members should attain a reuse or recovery rate of 85% and reuse or recycling rates of 80% and by 2015 rates of 95% and 85%, respectively. Some of the salient features were:

- Directives covered ELVs, including components, materials, and spare and replacement parts
- Continuous improvement in recycling of all plastics from ELVs
- Integration of requirements for dismantling, reusing, and recycling of ELVs into the design and manufacturing of new vehicles
- Encouragement for development of markets for recycled materials
- Ensuring set-up of appropriate collection systems for discarded ELVs without degrading the environment

In 2006, a total of 8000 authorized ELV dismantlers and 232 shredding facilities operated within the EU-25 territory (Yi and Park, 2015). EU attempted to reduce the amount and hazardousness of ASR through various post-shredder treatments.

In Germany, Umweltpramie scheme was launched in January 2009. The government wanted to stimulate the automobile industry after the 2008 economic recession. A purchase incentive of €2500 was provided for a Euro 4 compliant car, in exchange of a car that is more than 9 years old. The scheme promoted the latest technology but scrappage activities were not monitored and various reports suggested ELV exports to African/ Eastern European countries. The government has launched another scrappage policy in October 2018 with the aim to reduce emissions and decrease air pollution. The owners of old diesel cars could either upgrade the hardware or avail fiscal incentives. The onus was on the users to shift to lower emission cars.

In France, Prime à la Casse scrappage scheme was announced in 2009, similarly to boost the automobile industry. The conditional subsidy of €3000 was provided to scrap higher emitting vehicles and replace with the vehicle with internal combustion engine (ICE) and €5000 was provided for a new electric vehicle. The conditional eligibility bonus based on CO_2 emissions of the scrapped vehicle, list price, and the household income. The scrapped vehicle was sent only to certified auto recycling companies.

4.4 Japan

In 2005, ELV recycling legislation was enacted to process an estimated 5 million ELVs/year, which obliged the manufacturers to take responsibility for their ELVs (Ventura et al., 2020). Japan in 2009 introduced the Eco-Car programme, which consisted of two parts: one was a replacement programme, where consumers received a subsidy of Japanese Yen (JPY) 250,000 to replace a car which had been registered for more than 13 years with a standard-sized eco-friendly car and JPY125,000

21 Details available at https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2000L0053:20050701:EN:PDF

for mini vehicles with engines up to 660 cc. The second part was for purchase without a trade-in, where the new car should have fuel efficiency at least 15% higher than Japan's 2010 fuel efficiency standard and a 4-star emissions performance rating, which translated to 75% less emissions levels of 2005 Japanese standards (Canis et al., 2010). If consumers bought a fuel-efficient car without trading the ELV the subsidy was JPY 100,000 for standard cars and JPY 50,000 for mini vehicles. The subsidies applied to new cars meeting certain fuel consumption standards and owners were required to use them for at least one year. In Japan, vehicle manufacturers are mandated to take back and recycle airbags and ASR and ensure treatment of fluorocarbons. The recycling rates for airbags and ASR are 85% and 70%, respectively. The mixed ASR is used for thermal energy generation.

4.5 United Kingdom

The Car scrappage scheme[22] was introduced in May 2009 to boost the automotive sector after the 2008 financial crisis and slowdown in the sector. A discount of £2000 was offered on the purchase of a new vehicle, which was equally borne by the government and automotive sector. The conditions on old vehicles were that they should have been registered with the last owner for the past 12 months and must be at least 10 years old, be insured, have the latest tax disc and Ministry of Transport test certificate, and weigh less than 3.5 tonnes. The new vehicle should weigh less than 3.5 tonnes and have no former keepers. There were no specifications on regulations for dismantling or handling disposed of ELVs (Aldred and Tepe, 2011). The equal onus on automobile firms to pay discounts is to put the principle of extended producers' responsibility. In 2017, the National Vehicle Scrappage Fund, a proposal to improve air quality in the UK and deal with the problem of existing diesel vehicles was introduced.

Table 3: Summary of global scrappage policies

Country	Policy Outline	Emission norms
Canada	To stimulate new car sales, with reduction in carbon emissions by encouraging purchase of fuel-efficient low CO_2 emitting vehicles	Removal of vehicles older than the 1995-year model
China	The focus was to control pollution and incentives for the purchase of new cars and trucks were offered	Disposal of below China 1 Emission Standard (yellow-label) vehicles
France	Boost the automobile industry	Conditional bonus based on CO_2 emissions of the scrapped vehicle and purchase of ICE or electric vehicle
Germany	Economic stimulus for the auto industry	Purchase of Euro 4 compliant vehicle
Japan	Eco-Car programme consisted of two parts: a replacement programme and purchase without a trade-in	New vehicle Fuel efficiency is at least 15% higher than Japan's 2010 fuel efficiency standard and a 4-star emissions performance rating
United Kingdom	The vehicle scrappage scheme aimed to boost the automotive sector during the downturn	–

Source: TERI's compilation

22 Details available at https://researchbriefings.files.parliament.uk/documents/SN05177/SN05177.pdf

5. Challenges for Scrappage Policy in India

The vehicle scrappage policy was introduced to create an ecosystem for phasing out of unfit and polluting vehicles. Currently in India, most vehicle scrapping units were informal, which has lot of environmental concerns.

1. **Current infrastructure facilities and financial mechanisms for vehicle scrappage would not be able to trigger a large-scale scrappage of ELVs**

   a) There are inadequate numbers of registered vehicle scrapping facilities. Only six vehicle scrapping centres have been functional under the Motor Vehicles (Registration and Functions of Vehicle Scrapping Facility) Rules, 2021.

   b) Inadequate number of ATS - No Automated testing station is functional as per the Central Motor Vehicles (Twenty-first Amendment) Rules, 2021.

   c) The informal sector, given the crude methods employed for dismantling, has slow processing that certainly cannot handle the increasing volume of ELVs with constraints of land and access to business finance.

Figure 11: Challenges in vehicle scrappage in India

Source: TERI Analysis based on various stakeholders' consultation

   d) On-road inspections of vehicular emissions are part of efficient I/M testing. Currently, vehicles are intercepted on-road which is time-consuming and inconvenient to citizens and there is the availability of automated devices for inspection.

   e) The entire onus of providing incentives to owners for ELV scrappage depends on the discretion of the state governments and OEMs.

   f) Economic endowment effect comes into play when owners value their possessions, i.e., the owners consider their ELV at a higher level than the residual value. Therefore, to convince private owners to scrap, a greater compensation than its second-hand value is required.[23]

2. **Criteria for fleet renewal/scrappage policies should be to induct vehicles complying with the latest emission norms**

   a) The control of emissions for on-road vehicles is important as vehicles that emit above permissible levels, depending on vehicle condition and age, quality of fuel, roadway condition, etc. This requires stringent inspection and maintenance (I/M) testing.

   b) The monitoring of the testing certification is limited due to the lack of a centralized database linking vehicle registration with the testing facilities. It is difficult to keep track of vehicles that fail emission testing and to ensure retesting of these vehicles within the timeframe.

3. **Viability for original equipment manufacturers (OEMs) to set up ELV scrappage units**

   a) The business viability for setting up a dismantling unit can be justified only with large volumes of ELVs.

   b) The entire chain from fitness testing centres to vehicle collection centres and dismantling to recycling units should be designed for maximum economic benefits and minimum environmental degradation.

23 Proposal for a National Vehicle Scrappage Fund, London, 2019

c) The acceptance of non-original equipment parts in vehicles from the replacement market as there is no regulation in existence controlling the after-market parts.

d) Extended producers' responsibility (EPR) for OEMs to handle the ELVs is absent.

4. Usage and disposal of hazardous materials in vehicles

a) The materials arising from de-pollution or dismantling of components shall be recycled or disposed of in accordance with Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, Solid Waste Management Rules, 2016, and E-Waste Management Rules, 2016.

b) The dismantlers in the informal sector work without modern equipment and the process leads to contamination of the environment due to improper disposal of hazardous fluids and gases such as transmission, coolant, brake, and hydraulic fluid.

c) If refrigerants such as Freon (R-22) and tetrafluoroethane (R-134a) are allowed to escape from air conditioning units, which is the case in the informal sector, it can destroy parts of the ozone layer, therefore, the phase-out of this chemical began with the Kyoto Protocol ratification.

There is a requirement for an approved agency for collection and treatment of Freon gas, collected during the depollution of the ELVs and also the guidelines for CNG cylinder disposal.

-MSTI

d) The circular economy framework to integrate the usage of recycled materials and secondary components is missing.

e) Currently, the Freon gas is getting accumulated at the depollution stage at RVSFs and there is a requirement for an authorized vendor for collection.

f) Different grades of plastics mixed in the recycling process can result in total breakdown or different properties of the new product. Plastic is usually difficult to differentiate solely based on the type of product but is identified by unique codes. The most challenging stage in plastic recycling is segregation.

6. Recommendations

6.1 Role of government

A stringent regulatory framework, which explains the role of each stakeholder, can overcome the challenges associated with the current ELV management.

Inspection and Maintenance (I&M)

- To implement an I&M system, setting up automated test stations requires land and machinery. For setting up of ATS, state governments should support allocation of land that allows for frequent upgradation. The government can explore public-private partnerships for setting up automated testing station (ATS).
- To ensure compliance with the fitness tests, a centralized database of vehicles needs to be updated regularly. Notices must be sent to the registered owners for fitness tests and non-compliance should attract a penalty.

Regulatory environment

- For manufacturers to meet the design standards of vehicles, Automotive Industry Standard-129 should be mandated immediately.
- A list of the vehicle parts that are non-critical and can be reused, such as the wiper motor, should be clearly mentioned by the government.
- ELV depollution centres (EDC) within or outside RVSF can be promoted. The EDC can be established within or in close proximity to the major informal ELV markets with the essential procedural requirements. This will empower dismantlers in the informal sector and reduce the environmental effects.

Phased Implementation

The states with the highest vehicle population are apt to be the focus in the first phase of implementation namely Maharashtra, Uttar Pradesh, Tamil Nadu, Gujarat, and Karnataka (RTYB 2017–18 and 2018–19), with restrictions on registration of vehicles after a certain age in the non-origin state, as vehicles registered in one state are shifted to another state that has laxed enforcement.

For heavy-duty vehicles (HDVs) and light-duty vehicles (LDVs) used for commercial transport, the scrappage and replacement should be incentivized for a cleaner vehicle changeover. A study can be conducted for the commercial vehicles segment to scrap heavy trucks and buses that are pre-BS-II vintage as the first step, which has the potential to substantially reduce PM and NOx emissions.

Improve customer awareness

Public awareness is the main factor in determining the success of vehicle scrappage policy (Shao et al., 2016). Any awareness programme should be tailored towards potential participants at a regional level by the state governments.

Support to RVSF

Major investment for RVSF is land acquisition. The state governments should assist in the establishment of RVSFs because of the high resource-intensive nature. The recycling centres in the districts can be supported and developed with the aid of the local authorities.

Dispute resolution of ELVs

The dispute resolution in accident vehicles takes a long time and leads to the deterioration of vehicle parts. Faster resolution and deregistration, with the help of the local police, can fast-track the scrapping of vehicles.

6.2 Incentives and disincentives

Incentives

1. Customers

a) An indicative scrap value of an ELV should be based on the weight of the vehicle and the market value of the materials that are obtained to be given by the RVSF.

b) The purchase discount should be provided by OEMs to the registered owner in exchange of certificate of deposit.

c) Conditional purchase incentives for electric/hybrid/fuel-efficient vehicles can push their adoption among users.

Customer awareness about the vehicle scrappage policy and various incentives by the government should be a continuous education process through print/social media.

-MSTI

d) The certificate of deposit in exchange for the scrappage of the vehicle has been made tradable; this exchange needs to be regulated through the digital database.

2. RVSFs

a) Support for the acquiring of land or procurement of machinery should be provided by the state government.

Disincentives

1. OEMs

a) An advanced recoverability fee based on the weight of non-recoverable materials should be levied and distributed to RVSFs to ensure recyclability and recoverability rates.

2. Customers

a) An advanced recycling fee from the customers can be levied at the time of purchase, which allows consumers to partake in the recycling process.

3. RVSFs

a) Landfill taxes should be levied on RVSFs based on the volume of waste sent to the landfill to encourage appropriate dismantling and reduction in waste, and penal action must be taken against illegal waste dumping.

6.3 Role of OEMs

EPR activities for ELVs should include reverse logistics for taking back, recycling, recovery, and disposal of ELVs, which should be legally backed through clear targets in the policy. There is an immediate need for the policy mandate to ensure a high recyclability rate. Currently, some manufacturers have set up ELV facilities for dismantling and recycling, however, the government should bring all manufacturers under the purview. To calculate the recyclability/recoverability rates, OEMs should provide detailed information regarding the nature and mass of all materials used in the manufacturing of the vehicles such as volume of the fluids, etc.

6.4 3Rs - recycle, reuse, reduce - from the design stage for new vehicles

- OEMs should create recyclable vehicles beginning from the design phase such as for materials used in vehicles. OEMs should use materials that can be easily recycled.
- To achieve recoverability and recyclability levels at par with EU standard (EU 2000/53), vehicles manufactured should be reusable and/or recyclable to a minimum of 85% by mass and reusable and/or recoverable to a minimum of 95% by mass.

Recycling of gases

Collection of refrigerant gases is mandatory; however, no recycling rate has been determined for these gases. There is a requirement for an authorized vendor for the collection of the Freon gas accumulated at the depollution stage. A safer material in air-conditioning equipment which has a global warming potential of less than 150 as recommended by the EU 2006/40 can be a replacement.[24]

Recycling plastics

As per AIS-129, to facilitate the identification of plastic components vehicle manufacturers should use components and material coding standards. Furthermore, OEMs should try to standardize the usage of recycled materials for components with a clear indication of the type.

Restriction on the usage of heavy metal

The management of electric ELVs and batteries must not be an afterthought, but must be built into the electric vehicle policies from the beginning. At present, lead acid batteries are in use and considering the new technologies appropriate phase out of lead needs to be deliberated.

24 Details available at https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:161:0012:0018:en:PDF

BIS standards should be developed for the market acceptance of recycled and resource-efficient products such as the sale of secondary parts. The strict enforcement by pollution control boards should verify that no hazardous component be used in the manufacturing of new vehicles as per AIS-129.

6.5 ELV management

In India, due to low labour rates ELV centres dismantle most of the parts before compacting the vehicle body, therefore, requirement of shredders at this juncture is not there. The skill level of dismantlers, in the informal sector for the effective removal of components can be adopted. A regional consultation in established informal markets should be undertaken for capacity building of these units.

Table4: Roles and responsibilities of stakeholders for implementation

Stakeholder	Recommendation	Roles and responsibility
Central Government	AIS-129 should be mandated immediately	With a list of non-critical vehicle parts that can be reused
	Extended producers' responsibility should be included	Backed through clear targets in the policy
	Phased implementation of the policy	Coordination with states where vehicle population is highest
State Governments	Set up automated test stations to implement I&M system	Support allocation of land
	Ensure compliance with fitness tests	Maintain database of vehicles with regular updates
	Phased implementation of the policy	Coordination with central and other state governments to restrict ELV movement
	Increased public awareness	Continuous process through print/ social media
	Assistance to RVSFs	Support in establishment of RVSFs
	Incentives	Conditional purchase incentives for electric/ hybrid/ fuel-efficient vehicles
	Inclusion of all stakeholders	• Inclusion of informal sector • Advanced recoverability fee from OEMs and recycling fee from customers
Enforcement agencies	Uniform implementation throughout the country	Clear guidelines and regulations
OEMs	Extended producers' responsibility should be included	Vehicles manufactured should be >85 % by mass reusable and/or recyclable and >95 % by mass reusable and/or recoverable
	Recoverable design for new vehicles	• Recycling of gases and plastics used in manufacturing • Restriction on usage of heavy metals • Adequate classification/ labelling of plastics
	Incentives	Purchase discount to registered owner
Local police	Dispute resolution of ELVs	Faster resolution to fast-track scrapping of ELVs
RVSFs	Creation of environmental and safety standard compliant infrastructure	High investment in modernization of dismantling ELVs

Source: TERI's compilation

7. Conclusion

The vehicle scrappage policy is in its nascent stage in India as it has been only a year since the MoRTH notification. The physical infrastructure for registered vehicle scrapping facilities is growing across the country mainly near the metropolitan cities gradually. Therefore, the dismantlers can be treated as extended hands in ELV management at RVSF.

As the policy aims to scrap the vehicles failing fitness test, a rigorous testing procedure that is up to date with the latest testing norms is required. The channelizing mechanism for ELVs should facilitate the sustainable movement from its source to recycling, treatment, and disposal, which will translate to better recovery and recycling. Reverse logistics for the collection, recycling, and disposal should be a part of EPR operations for ELVs and these activities should be legally supported by clear policy targets.

The vehicle design should promote reuse, upgradability, disassembly, and recycling by OEMs by creating recycling-oriented vehicles. The government should assist in the establishment of RVSFs and provide continuous education for customer awareness about the vehicle scrappage policy and various incentives. Also, cluster-based pilots can be established by the government in collaboration with the OEMs to showcase ELV management as a successful business model under appropriate scientific and conducive environment.

The vehicle scrappage policy aims to reduce air pollution by removing unfit and polluting vehicles, to accomplish resource efficiency by serving as a potential secondary resource stream that can minimize the trade-off between development and environmental welfare, and to establish an environmentally sound vehicle scrappage ecosystem in the country.

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Annexure

Annexure A

The equation used for the projection of end-of-life passenger cars,

The Gompertz equation used for ELV projection $V = V_t e^{ae^{-bGDP}}$

Where, V is the saturation level of future maximum passenger vehicles

V_t is vehicle ownership in year t (passenger cars per 1000 people)

GDP_t is the per capita GDP in year t

a= -9.32 and b= -0.00014 (Singh et al., 2020)

$$C_t = \frac{V_t \text{ x } P_t}{1000}$$

Where, C_t is the car stocks

P_t is the population in year t

$ELV_t = S_t - C_t + C_{t-1}$

Where, ELV_t is end-of-life passenger car generation in year t

and S_t is passenger car sales in the year t.

Annexure B

Table 5: Green tax in selected state

State/ UT	Class of Vehicles	Tax Amount	Exemption
Andhra Pradesh[24] and Telangana[25]	Transport vehicles >7 years of age from the date of registration	INR 200 annually	A vehicle operated by LPG, CNG, battery or solar power
	Non-transport vehicles >15 years of age from the date of registration a. Motor cycles b. Other than motor cycles	For 5 years a. INR 250 b. INR 500	
Dadra and Nagar Haveli and Daman and Diu[26]	Non–transport vehicles >15 years from the date of registration a. Two wheelers b. Other than two-wheelers	Per five years a. INR 250 b. INR 500	
Maharashtra[27]	Transport vehicles >8 years from the date of first registration except for CNG and LPG vehicles and Transport vehicles >15 years from the date of first registration and running on CNG or LPG a. Three-wheeler auto-rickshaw b. Taxis fitted with fare meters and permitted to carry not more than six passengers and jeep type motor cab (black and yellow) c. Tourist taxi d. Light goods vehicles	For every 5 years a. INR 750 b. INR 1250 c. INR 2500 d. INR 2500	
	Transport vehicles other than that are covered entry above >8 years old a. Medium heavy and articulated goods vehicles with a gross vehicle weight of more than 7500 kg b. Contract carriage buses and motor vehicles, private service vehicles, and special purpose vehicle	For every year a. 10% of annual tax b. 2.5% of annual tax	
	Non-transport vehicles >15 years from the date of their first registration a. Two-wheeler b. Other than two-wheeler (Petrol driven) c. Other than two-wheeler (Diesel driven)	For every 5 years a. INR 2000 b. INR 3000 c. INR 3500	

24 Details available at https://www.aptransport.org/html/taxes-greentax.html
25 Details available at https://www.transport.telangana.gov.in/html/taxes-greentax.html
26 Details available at https://daman.nic.in/rtodaman/taxation_schedule.asp
27 Details available at https://lj.maharashtra.gov.in/Site/Upload/Acts/The%20Maharashtra%20Motor%20Vehicles%20Tax%20Act.pdf

State/ UT	Class of Vehicles	Tax Amount	Exemption
Odisha	a. Transport vehicle > 15 years from date of registration a. Vehicles other than transport vehicles >15 years from date of registration	a. INR 4000 b. INR 1000	
Uttar Pradesh	Transport vehicles >15 years from the date of registration a. Motor cycle b. Auto-rickshaw (goods and passenger) c. Motor cab and maxi cab d. Light commercial vehicles (goods and passengers) e. Medium commercial vehicles (goods and passenger) f. Heavy vehicles (goods and passengers)	Per annum a. INR 200 b. INR 300 c. INR 400 d. INR 500 e. INR 600 f. INR 1000	
	Non-transport vehicles >15 years of age from date of registration	10% of tax paid at the time of registration	

Annexure C

List of Council Members

1. Mr Sudhendu J. Sinha, NITI Aayog
2. Mr Abhay Bakre, Bureau of Energy Efficiency (BEE)
3. Prof. Ashish Verma, Indian Institute of Science (IISc), Bangalore
4. Mr Amit Bhatt, International Council on Clean Transportation (ICCT)
5. Ms Akshima Ghate, Rocky Mountain Institute (RMI)
6. Mr Pawan Mulukutla, Clean Mobility & Energy Tech, WRI India
7. Ms Anumita Roy Chowdhury, Centre for Science and Environment (CSE)
8. Dr Himani Jain, Council on Energy, Environment and Water (CEEW)
9. Dr A R Sihag, The Energy and Resources Institute (TERI)
10. Mr Ambuj Sharma, Ex-DHI
11. Mr K K Gandhi, Auto and Fuel Expert

Annexure D

List of Expert Members for Vehicle Scrappage Policy Workshop

Date: August 24, 2022 | Time: 11.00 – 13.00 IST

1. Mr Paresh Kumar Goel, Ministry of Road Transport and Highways (MoRTH)
2. Dr Reji Mathai, Automotive Research Association of India (ARAI)
3. Mr Amitava Roy, Maruti Suzuki Toyutsu India Private Limited (MSTI)
4. Mr Lalit Sharma, Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ) GmbH
5. Mr Sahil Patel, Central Pollution Control Board (CPCB)
6. Prof. Ashish Verma, Indian Institute of Science (IISc)
7. Dr A R Sihag, The Energy and Resources Institute (TERI)
8. Dr Suneel Pandey, The Energy and Resources Institute (TERI)
9. Dr Himani Jain, Council on Energy, Environment and Water (CEEW)
10. Ms Nupur Ahuja, The Climate Group
11. Ms Spurthi Ravuri, Centre for Study of Science, Technology and Policy (CSTEP)