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TOWARDS A CIRCULAR ECONOMY: LEGAL GOVERNANCE OF END-OF-LIFE VEHICLES IN INDIA

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I. ABSTRACT

The growth of urban areas in India and the increased ownership of motor vehicles, has led to a large number of end-of-life vehicles (ELVs) being produced, creating a serious issue for urban waste management and environmental governance, if these ELVs are not effectively regulated, they can cause serious environmental damage, risk to public health and wastage of resources when disposed of, particularly within densely populated urban centres where most ELVs are dismantled by informal operators. This research paper will conduct a critique and examination of the legal and regulatory framework associated with ELVs in India in order to identify opportunities to integrate principles of circular economic into the management of ELVs to create sustainable governance throughout all stages of the life cycle of a vehicle. Utilising a doctrinal research methodology the study will review and address constitutional provisions; the environmental jurisprudence developed from Article 21 of the Constitution of India and relevant key pieces of legislation such as Environment (Protection) Act; Motor Vehicles Act; Hazardous and Other Wastes Rules; E-Waste Rules and policy instruments such as the National Vehicle Scrappage Policy; the proposed circular economy frameworks from NITI Aayog. The review of laws, regulations and policies will highlight key regulatory gaps in governing ELVs, including the lack of ELV specific legislation, dominance of formal recycling sector, weak law enforcement mechanisms, poor implementation of extended producer responsibility and limited inter-agency cooperation. This article presents a holistic legal system concerning circular economy principles; thus, it emphasizes establishing dedicated ELV legislation, improving EPR obligations and formalising informal recycling systems. It further discusses enhancing co-ordination of institutional mechanisms and consumer driven incentives to encourage environmentally responsible disposal practices. Finally, the research has demonstrated that an integrated ELV regulation frameworks combined with legally

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binding circular economy frameworks create urban waste challenges opportunities to increase resource efficiency and foster sustainable development.

II. KEYWORDS

End-of-Life Vehicles, Circular Economy, Urban Waste Management, Regulatory Gaps, Sustainable Urbanization.

III. INTRODUCTION AND RESEARCH PROBLEM

The fast-growing number of motor vehicles in India resulting from economic success and urbanization represents a new and very serious environmental and regulatory issue associated with ELVs. The increased use of vehicles for the purpose of mobility has led to increased productivity and accessibility; however, they also have produced a large number of vehicles that are no longer usable and fit for the road. In particular, many of those unfit vehicles are found in urban locations and are often disposed of in an informal, unscientific manner, resulting in significant environmental harm, risks to public health and inefficient use of valuable materials.[3]

Air pollution, soil contamination and groundwater contamination in highly populated urban areas is a result of improper handling of ELVs as they leak hazardous materials like oil and heavy metals and other toxic fluids. Furthermore, there is no formal recycling system for ELVs so recoverable materials such as steel, aluminium and plastics are lost; thus, diminishing the efficiency of our valuable resources. As a result, ELVs are not solely a waste management issue but rather an issue of global environmental governance and sustainable urban development.

The principal issue that forms the basis of this study is the lack of complete and cohesive legal framework in India relating to ELVs. There exists a series of constitutional mandates and numerous statutory provisions pertaining to environmental regulation, transport regulation and waste management, yet no single piece of legislation exists related exclusively to ELVs. Regulatory authority exists in

[3] David C. Wilson et al., Role of Informal Sector Recycling in Waste Management in Developing Countries, 30 HABITATS INT'L 797, 802–07 (2006).

disparate areas of law with poor enforcement capabilities, lack of coordination between institutions and little accountability on behalf of all parties involved.[4]

Due to the fragmented nature of the current legal framework regarding ELVs there exists a significant disparity between India's policy commitment to circular economy principles and what actually occurs on the ground with respect to management of ELVs. Life cycle regulation of ELVs does not currently exist; the implementation of Extended Producer Responsibility (EPR) is weak; and non-formal sectors continue to dominate recycling of ELVs. Thus, the inability of the current legal framework to adequately integrate environmental protection with resource efficiency further limits the capacity of the framework to assist in promoting sustainable urbanisation.

A. Research Objectives

The objectives of this study are as follows:

1. To investigate the concept of ELVs within Circular Economy Principles.
2. To review the constitutional and statutory framework for the management of ELVs in India.
3. To assess the effectiveness of existing regulations, including the National Vehicle Scrapping Policy, which govern ELVs.
4. To identify gaps in regulation, institutions and enforcement in the governance of ELVs.
5. To recommend legal and policy reforms for developing an effective and sustainable framework for the management of ELVs in India.

B. Research Questions

This research aims to answer the following questions:

1. To what extent do circular economy principles impact the management of ELVs?
2. Does the current constitutional and statutory framework in India sufficiently regulate ELVs?

[4] G.N. Gill, Environmental Governance and Sustainable Development in India, 27 J. ENV'T L. 219, 228–34 (2019).

3. To what degree are current policy measures successfully addressing issues related to ELVs?
4. Is there a significant gap in the regulation, enforcement and institutional capacity for ELVs in India?
5. How can reforms to legal and policy improve the sustainable and efficient management of ELVs in India?

C. Research Hypothesis

1. The current legal framework concerning ELVs in India is fragmented and inadequate resulting in inefficient regulation.
2. The absence of a comprehensive legal framework incorporating circular economy principles and Extended Producer Responsibility significantly hinders sustainable ELV management in India.

D. Research Methodology

The study adopts the doctrinal method of research by principally using secondary source data. The legal analysis will examine the constitution, statutes, subordinate legislation, policy documents and case law regarding environmental law, transport regulation and waste management within India. It will specifically look into key pieces of legislation like the Environmental (Protection) Act 1986, Motor Vehicles Act 1988, Hazardous and Other Wastes (Management and Transboundary Movement) Rules 2016 and E-Waste (Management) Rules 2022, along with policy frameworks such as the National Vehicle Scrappage Policy 2021 and reports by NITI Aayog concerning circular economy and resource efficiency.

In addition, the researcher will utilise academic literature, journal articles and government reports to conduct a critical appraisal of the efficacies of the current legal framework. The doctrinal approach will permit the researcher to evaluate the legal principles in a comprehensive manner, identify regulatory gaps and provide recommendations for improving ELV governance in India.

E. Literature Review

Scholarly interest in ELVs has increased over the past few years related to Environmental Governance, Waste Management and Sustainable Development. The literature currently available indicates a multidisciplinary approach to ELVs through an examination of Environmental Impact; Regulatory Frameworks; Circular Economy Principles; Institutional Issues. However there has not been a comprehensive legal analysis of ELV Governance in India using a Circular Economy and Extended Producer Responsibility (EPR) lens.

The authors Kirchherr; Reike and Hekkert (2017) identified the circular economy to be a regenerative system that recycles, recovers and/or reuses resources and minimizes both the amount of resource inputs and the amount of waste produced. Likewise, Geissdoerfer et al. (2017) emphasize that a circular economy can assist in reconciling economic growth with environmental sustainability. In the context of once-elite vehicles (ELVs), the principles that define a circular economy emphasize the concept of lifecycle management, material recovery and the reduction of environmental externalities.

The studies conducted by Sakai et al. (2014) and Vermeulen et al. (2011) substantiate that ELVs are important waste streams for the circular economy because they are composed of both hazardous and valuable materials. The authors of these studies provide support for the need to combine environmental protections with resource efficiencies. The literature clearly demonstrates that ELVs, if managed correctly, have the potential to provide significant amounts of secondary raw materials, thereby decreasing the need for virgin materials.

There is a wealth of literature on comparative regulatory regimes, particularly the European Union's End-of-Life Vehicles Directive (2000/53/EC). Authors (Coulter, 2010; Milios, 2018) consider how the EU's model has been established to incorporate aspects such as mandatory recycling targets, obligations for extended producer responsibility (EPR) and restrictions on hazardous substances. As a result, it is widely considered an exemplary model for the integration of circular economy principles into legally binding frameworks.

Further, comparative studies of Japanese and South Korean ELV management systems also illustrate the existence of advanced EPR based producer responsibility and highly technically advanced recycling methodologies. In particular, Tojo (2004) has demonstrated the use of EPR as a mechanism to transfer responsibility for ELV management from governments to manufacturers, thereby creating incentives for manufacturers to produce eco-designed products and adopt sustainable production practices.

Regional frameworks are complemented by international instruments regulating hazardous waste streams related to ELVs. They include the Basel Convention and the Stockholm Convention, which create obligations regarding the environmentally sound management of hazardous waste, restrictions on the transboundary movement of hazardous waste and eliminating the use of toxic materials in certain products that could lead to hazardous waste when those products reach the end of their useful life. The international instruments' application to ELVs is indirect and relies mainly on domestic implementing legislation.

The international experiences discussed above highlight the need for developing comprehensive legislation to support the development of ELV management systems and provide the necessary institutional coordination, which is relatively underdeveloped in India.

Indian scholars have also conducted considerable research regarding the concepts of how "environmental governance" can be regarded under (a) the Constitution and (b) statutes. This has included works written by Shyam Divan, Armin Rosencranz and P. Leelakrishnan regarding Article 21 of the Indian Constitution and its broader interpretation through judiciary decisions, including M.C. Mehta v. Union of India, Vellore Citizens' Welfare Forum v. Union of India, etc., as building blocks for environmental jurisprudence in India.

Concerning waste management, the literature regarding the Environment (Protection) Act, 1986 and related regulations/treaties indicates that we have a different regulatory framework based on different waste types or categories. Some scholars comment that while good waste regulations are now available for the types of plastic

waste, e-waste and dangerous waste, there are no ELV-specific legal regulations; thus, resulting in a regulatory void. Rajamani (2015) and Gill (2019) each argue that the fragmented nature of environmental law will create limited enforcement of regulations and accountability etc.

Government agencies, such as NITI Aayog and the Central Pollution Control Board (CPCB), have conducted policy-related investigations about how "end of life vehicles" (ELVs) may contribute to India's goal of transitioning to a circular economy. In accordance with NITI Aayog's reports, they conclude that the automobile sector represents one particular "area of resource efficiency," and produces significant possibilities for material recovery and dependencies on imported materials could be eliminated if action is taken to recover materials found in ELVs.

However, academic critiques of the existing policy frameworks point out that the policies are non-binding and that there is minimal implementation associated with these programs. The National Vehicle Scrappage Policy (2021) has been reviewed through various studies as being progressive, but also lacks statutory backing and as a result, the policy has been adopted to varying degrees of success among Indian states. According to Chaturvedi (2022), without legal enforceability and institutional capacity, "ELV" is not adequately enforced through the use of policy alone.

Numerous researchers have published studies that focus on the informal sector's contribution to waste management in India. According to Agarwal et al. (2015) and Wilson et al. (2006), many complex waste streams, including ELVs, are managed by the informal sector through an informal recycling system. While these individuals play an important role in recovering material from these types of wastes, they do so in a manner that is not environmentally sustainable and is generally not subject to government regulation.

Research also indicates that leaving out informal actors from formal policy means that there is a gap between the intended use of laws and how they are actually being applied, which in turn results in events such as pollution, unsafe working conditions and an inability to use resources efficiently. Researchers generally agree that

integrating and formalizing informal actors into regulated waste management systems will close this gap.

The term Extended Producer Responsibility is a topic that has received considerable attention through the lens of waste management. Lindhqvist (2000) argue that EPR provides the opportunity for shifting the waste management responsibility away from consumers and placing it with producers in order to promote sustainable design and accountability throughout a product's lifecycle. In India, EPR has been implemented effectively in the areas of electronic waste and plastic waste; however, the literature shows that the application of EPR in the automotive industry is quite limited. There is a lack of binding EPR requirements for vehicle manufacturers which leads to a weak governance structure regarding the lifecycle of vehicles and the continued reliance on informal recycling practices.

While existing literature provides valuable insights into environmental law, circular economy and waste management, there is a noticeable gap in integrated legal analysis of ELV governance in India. Most studies focus either on policy evaluation or environmental impacts, with limited emphasis on the structural and legal inadequacies of the current framework.

Moreover, there is insufficient scholarly engagement with the intersection of ELV regulation, circular economy principles and constitutional mandates. This study seeks to fill this gap by providing a comprehensive doctrinal analysis that connects legal frameworks with sustainability objectives, thereby contributing to the evolving discourse on circular economy governance in India.

IV. CONCEPT OF END-OF-LIFE VEHICLES AND CIRCULAR ECONOMY

An "end-of-life vehicle" (ELV) is defined as a motor vehicle that has surpassed its operational period due to age, mechanical defects, failure to meet standards or exceeding reasonable cost of repair. ELV's constitute a unique waste product category and cannot be treated like other discarded goods from a legal standpoint. They are complex products comprised of a variety of materials containing both hazardous

substances such as lead-acid batteries, oil-based fluids, coolant, etc. along with valuable followable materials such as steel, aluminum, copper and plastic.[5] Therefore, improper recycling procedures will create both environmental contamination due to hazardous materials and a loss of recyclable resources due to poor recycling processes. Accordingly, ELVs must be regulated for both environmental protection and material resource management efficiency.[6]

As cities continue to expand, the numbers of ELVs also increase and they often generate an uncontrolled stream of urban waste. The density of vehicles in urban areas and the existence of unregulated informal dismantling operations mean that both the environment and public health are at risk. Unscientific recycling of materials in the informal sector contaminates soils, pollutes ground water and exposes people working in these sectors to health and safety hazards.[7] The lack of systematized material recovery creates an enormous economic loss, as high-value secondary raw materials are lost or recovered inefficiently, thus placing ELVs at the intersection of environmental law, urban waste management and industrial policy.[8] In this context, ELVs need to be regulated in a manner that looks at the entire lifecycle of the vehicles, rather than just regulation dealing only with their disposal.

The circular economy model will address this issue by moving from the traditional linear economy of "produce-use-dispose" to a regenerative economy that emphasizes re-use, remanufacturing and recycling.[9] The concept of a circular economy requires that ELVs be viewed as valuable resources and not as waste products. This results in designing vehicles to facilitate dismantling and recycling of materials, producing

[5] Shin-ichi Sakai et al., An International Comparative Study of End-of-Life Vehicle (ELV) Recycling Systems, 33 J. MATERIAL CYCLES & WASTE MGMT. 1, 3–10 (2014).
[6] I. Vermeulen et al., Can the Global Automotive Industry Reach the Recycling Targets Set by the EU End-of-Life Vehicles Directive? 45 WASTE MGMT. 131, 134–42 (2011).
[7] Madhu Agarwal, Role of Informal Sector in Solid Waste Management in India, 35 INT'L J. ENV'T STUD. 45, 49–54 (2015).
[8] Wilson et al., supra note 1, at 801–09.
[9] Julian Kirchherr, Denise Reike & Marko Hekkert, Conceptualizing the Circular Economy: An Analysis of 114 Definitions, 127 RES. CONSERVATION & RECYCLING 221, 224–29 (2017).

efficient material recovery processes and reducing reliance on landfills, thus enabling sustainable management of urban resources while conserving the environment.[10]

A significant part of the circular economy model is Extended Producer Responsibility (EPR), which requires manufacturers to be responsible for the end-of-life stage of their products.[11] When it comes to motor vehicles, there are two ways that EPR helps promote sustainable design: first, by encouraging manufacturers to create products with a focus on recyclability and producing or supporting a formal recycling system for their products at the end-of-life stage. While many countries have a developing EPR for e-waste and plastic waste in India, there are very few examples of how EPR has been applied to ELVs. Expansion of EPR into the automobile industry is indicative of the changing nature of regulation, with a new focus on lifecycle accountability and shared responsibility between multiple stakeholders.[12]

The shift to a circular economy in India is motivated by a combination of environmental and economic drivers. India is heavily dependent on importing raw materials to manufacture mostly metal products; this demonstrates how vital recycling and using secondary resources will be for transitioning to a circular economy. The automobile industry is critical in the transition due to its high material intensity and the scale of production. Through managing ELVs effectively, we will not only be able to reduce the number of primary resources needed but also reduce greenhouse gas emissions from production and foster sustainable growth in industry.[13]

When viewed through the lens of a circular economy, it is clear that current legal definitions of ELVs have not adequately responded to this new environment, in that such laws define ELVs as a waste rather than as a source of potential value. This gap

[10] Martin Geissdoerfer et al., The Circular Economy – A New Sustainability Paradigm? 143 J. CLEANER PROD. 757, 761–68 (2017).
[11] THOMAS LINDHQVIST, EXTENDED PRODUCER RESPONSIBILITY IN CLEANER PRODUCTION: POLICY PRINCIPLE TO PROMOTE ENVIRONMENTAL IMPROVEMENTS OF PRODUCT SYSTEMS 10–18 (Lund University 2000).
[12] NAOKO TOJO, EXTENDED PRODUCER RESPONSIBILITY AS A DRIVER FOR DESIGN CHANGE 91–112 (IIIEE, Lund University 2004).
[13] WALTER R. STAHEL, THE CIRCULAR ECONOMY: A USER'S GUIDE 45–58 (Routledge, 1st ed. 2019).

provides an opportunity to develop a broader, lifecycle-based regulatory framework that incorporates both environmental protection and resource efficiency and that supports the goals of sustainable urban development.

Global circular economy standardization policies like UNEP Circular Economy Framework promote resource efficiency through lifecycle analysis and sustainable materials recovery and use. Incorporating global sustainable development measures into India's legislative framework would provide a mechanism to move from a waste-based paradigm for ELVs to resource-based regulation of ELVs.[14]

V. CONSTITUTIONAL FRAMEWORK

Environmental protection and sustainable development are supported by the underlying principles of the Constitution of India with Sustainable Development having an equally firm legal basis. The Constitution empowers the State through its right to regulate anything that might harm the environment (including public health) through established legal mechanisms (i.e., legislative); Judicial decisions have developed environmental protection as a legally enforceable duty as opposed to a policy goal thereby providing Central & State Governments with the tools needed to regulate activities such as disposal, recycling and management of ELVs particularly in urban areas where environmental pressures are most strongly felt.[15]

The expansive interpretation of Article 21 of the Indian Constitution by the Supreme Court has facilitated extending the right to life and personal liberty to include the right to a clean, healthy and pollution free environment. The Supreme Court in M.C. Mehta v. Union of India[16], recognized that vehicular pollution constituted a serious threat to public health and environmental quality, and issued directions for the regulation and control of vehicular emissions. This approach was further strengthened in M.C. Mehta v. Union of India,[17] wherein the Court directed the transition of public transport vehicles in Delhi to Compressed Natural Gas (CNG) to curb rising air pollution levels

[14] United Nations Environment Programme, Circular Economy and Resource Efficiency Principles (2021).
[15] SHYAM DIVAN & ARMIN ROSENCRANZ, ENVIRONMENTAL LAW AND POLICY IN INDIA 95–118 (Oxford Univ. Press, 3d ed. 2022).
[16] M.C. Mehta v. Union of India, A.I.R. 1987 S.C. 1086 (India).
[17] M.C. Mehta v. Union of India, A.I.R. 2002 S.C. 1696 (India).

and emphasized that strict regulatory measures must be taken in relation to this illegal activity. The reasoning developed by the Courts is equally applicable to the management of ELVs because improper dismantling of ELVs and illegal recycling creates emissions of hazardous materials, contributing to the air quality-poor soil quality and groundwater pollution-common problems experienced throughout urban areas with high population densities. Therefore, regulation of ELVs is an administrative concern as well as a constitutional obligation because it is required in order to uphold the fundamental right to life.

The directive principles of state policy also emphasize the duty of the state to protect the environment, which imposes a duty upon the state to protect and enhance the environment and conserve the natural resources of India.[18] This is a non-justiciable provision; nonetheless, it has been repeatedly cited by the Indian judiciary in support of both legislative and executive action. In the case of Vellore Citizens' Welfare Forum v. Union of India[19], the Supreme Court of India integrated sustainable development as part of Indian environmental law and enshrined the polluter pays principle as a fundamental part of environmental governance. As such, the state has an obligation under statutory principles to regulate automotive waste, thus preventing environmental degradation resulting from improper disposal and ensuring that economic activities in the automobile industry do not cause a disturbance to ecological balance.

As per the Constitution, all individuals have a duty to safeguard nature and enhance it.[20] This expands environmental responsibility from the government to individuals, businesses and other groups with an interest in protecting our environment. Regarding ELVs, this imposes a responsibility on owners, producers and recyclers of ELVs to follow good environmental practices through the use of authorized recyclers/ scrap facilities and not use informal dismantlers. The Courts have used this provision as a basis for promoting public involvement and compliance and enhancing environmental governance mechanisms.

[18] INDIA CONST. art. 48A.
[19] Vellore Citizens' Welfare Forum v. Union of India, (1996) 5 S.C.C. 647 (India).
[20] INDIA CONST. art. 51A(g).

Judicial concerns about the inadequacies in waste management systems highlight constitutional obligations to regulate ELVs in similar ways. In Almitra H. Patel v. Union of India[21], for example, the Supreme Court found there was a failure by authorities to manage municipal solid waste and found a constitutional obligation of the state to provide for environmentally sound systems of waste management. While this case only involved municipal waste, the reasoning would also apply to ELVs, which are a unique and hazardous urban waste stream that needs to be systematically and regulated in order to properly manage them, rather than disposing of them informally.

The constitutional interpretation of Articles 21, 48A and 51A(g) in aggregate has resulted in the incorporation of environmental principles such as sustainable development, the precautionary principle and the principle of "polluter pays" into Indian law.[22] All of these principles provide guidance in making regulatory decisions regarding how to strike a balance between the competing interests of economic growth and environmental protection by providing the impetus for proactive measures to be taken and to provide accountability when there is damage to the environment. With respect to the regulation of ELVs, the three principles provide a very firm legal groundwork to support the promotion of circular economy practices, the imposition of producer responsibility and the establishment of methods for the environmentally sound disposal of waste.

Thus, the constitutional framework not only legitimizes the regulation of ELVs but also mandates that it be regulated as an extension of India's commitment to sustainable urbanisation and environmental governance. By transforming environmental protection from a discretionary policy goal to a binding legal requirement, it lays the foundation for the integrated and comprehensive management of ELVs in India.

In keeping with an international legal framework, it is evident that this constitutional framework is also consistent with the Rio Declaration of Environment and

[21] Almitra H. Patel v. Union of India, (2000) 2 S.C.C. 679 (India).
[22] Vellore Citizens' Welfare Forum v. Union of India, (1996) 5 S.C.C. 647 (India).

Development, which encompasses various principles related to protecting the environment.[23] Of particular note among those principles are the precautionary principle and the polluter pays principle. Both of these principles have been recognised and utilised by Indian courts. As a result, the consistency between domestic constitutional mandates and international norms provides additional support and credibility for implementing a more comprehensive and proactive approach to the governance of ELVs.

VI. STATUTORY FRAMEWORK GOVERNING ELVS

India's constitutional obligation toward the protection of the environment and the achievement of sustainable development is afforded expression through various statutory regulatory regimes that together regulate the management of End-of-Life-Vehicles (ELVs). Unlike other waste streams such as plastics and electronic waste there is no single piece of legislation that covers the entire lifecycle of ELVs, therefore there are many legal areas that cover aspects of the management of ELVs, including, but not limited to: environmental law, transport regulation and waste management frameworks for example. Despite these statutes being an incomplete regulatory solution for addressing ELVs, the lack of a cohesive, integrated legal framework presents substantial regulatory gaps when considering the management of ELVs as a separate urban waste stream in the larger urban sustainability context.

A. Environment (Protection) Act, 1986

The Environment (Protection) Act of 1986 (EPA) is the primary law for the protection of the environment in India and provides the main legal authority for regulating pollution and waste arising from ELVs. The legislation was developed in response to commitments made to the international community and grants the Central Government the power to take all measures necessary to protect and improve quality of the environment.[24] For ELVs, the EPA allows for the creation of subordinate legislation related to the dismantling, recycling, storage and disposal of all waste associated with vehicles. Its broad scope enables regulators to establish standards for

[23] Rio Declaration on Environment and Development, U.N. Doc. A/CONF.151/26 (Vol. I) (1992).
[24] Environment (Protection) Act, 1986 (Act 29 of 1986), ss. 3 & 6.

authorized vehicle scrapping facilities, regulate emissions and effluents resulting from the recycling process and ban the use of environmentally hazardous practices normally associated with the informal sector of the dismantling industry located within urban areas.[25] However, there is no special separate classification for ELVs in the governing legislation as a distinct form of waste, which limits the power of the governing body to enforce compliance through the provisions of the EPA and relies heavily on delegated legislation and the time and budget allocated to administering the governing laws.

B. Motor Vehicles Act, 1988

The Environmental Framework and the Motor Vehicles Act, 1988 provide a legal framework for instance in regard to defining when a vehicle is considered to be unfit for use (an ELV). This includes how vehicles are registered and how they will transition into an ELV through periodic testing of the vehicle's fitness, with the intention that the vehicle will not be allowed to be used once it is considered to be unfit.[26] The Motor Vehicles Act, 1988 provides the legal basis for removing unfit and environmentally harmful vehicles from circulation, particularly in urban areas, due to the fact that vehicular density is a significant contributor to the amount of pollution seen in these areas. Additionally, by providing a mechanism for the systematic identification and deregistration of ELVs, the Motor Vehicles Act, 1988 supports the principles of a circular economy by providing a mechanism for the formal disposal of ELVs through recycling, as opposed to through informal disposal methods.[27]

C. Hazardous and Other Wastes Rules, 2016

The Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, developed pursuant to the EPA, constitute a major technical tool for regulating the hazardous parts produced by dismantling ELVs. These Rules provide detail on how to handle, store, move and dispose of hazardous substances (e.g., used

[25] Central Pollution Control Board, Guidelines for Environmentally Sound Management of End-of-Life Vehicles 4–12 (2019).
[26] Motor Vehicles Act, 1988 (Act 59 of 1988), ss. 56 & 59.
[27] Ministry of Road Transport & Highways, Government of India, Voluntary Vehicle-Fleet Modernization Program (Vehicle Scrappage Policy) 7–14 (2021).

oils, batteries, heavy metals and toxic liquids). Furthermore, they set minimum requirements for obtaining an authorisation, keeping records and managing such waste in an environmentally sound manner, which collectively reduces risk to the environment and public health.[28] However, while these Rules are applicable to ELVs, they do so on an indirect basis since they only regulate the hazardous constituents of the ELV and do not treat ELVs as a single waste stream. The fragmented regulatory approach of the Rules therefore limits their potential to provide a full basis for effective management of the entire lifecycle of ELVs.

D. E-Waste (Management) Rules, 2022

The E-Waste (Management) Rules, 2022, notified by the Ministry of Environment, Forest and Climate Change on 2 November 2022 and effective from 1 April 2023, now govern the management of electronic waste generated from electrical and electronic components, including those contained in modern End-of-Life Vehicles (ELVs). Contemporary vehicles increasingly incorporate technologically advanced components such as sensors, electronic control units and digital interfaces, all of which contribute to electronic waste at the end of a vehicle's lifecycle. The 2022 Rules significantly strengthen the framework of Extended Producer Responsibility (EPR) by replacing the earlier collection-based targets under the 2016 Rules with a recycling-certificate-based compliance mechanism that imposes mandatory recycling obligations upon producers.

This transition reflects India's gradual movement toward lifecycle accountability and circular economy governance. Although the Rules were not specifically enacted for the automobile sector, their applicability to vehicle-related electronic components demonstrates the growing need for an integrated regulatory framework combining hazardous waste, electronic waste and vehicle dismantling processes. Nevertheless, even under the updated 2022 regime, India still lacks dedicated ELV-specific

[28] Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, rr. 3, 4 & sched. I.

provisions capable of comprehensively regulating the lifecycle management of vehicle-related electronic waste.[29]

The legal foundations of India's ELV regime are scattered across multiple regulatory frameworks and therefore remain inadequate to comprehensively address the complex challenges associated with ELV management. In addition to the Environment (Protection) Act, the Hazardous and Other Wastes Rules, and the E-Waste (Management) Rules, the Battery Waste Management Rules, 2022 (No. G.S.R. 663(E)), notified under the Environment (Protection) Act, 1986, have emerged as a significant component of India's evolving ELV governance framework, particularly in the context of the rapid growth of electric vehicles (EVs).

The Rules impose Extended Producer Responsibility (EPR) obligations upon battery producers, importers and recyclers by mandating environmentally sound collection, recycling, refurbishment and disposal of waste batteries, including lithium-ion batteries used in EVs. This reflects a shift toward lifecycle accountability and circular economy principles within the battery sector.

However, despite this progress, the Rules remain limited to battery waste management and do not establish an integrated ELV-specific framework addressing vehicle dismantling, material recovery, hazardous waste coordination and end-of-life vehicle traceability as a unified regulatory process. Consequently, transport regulators, environmental authorities and waste management agencies continue to operate in fragmented silos, resulting in weak coordination, regulatory gaps and continued dependence on informal dismantling systems in urban centres.

VII. POLICIES, REGULATIONS AND GOVERNMENT REPORTS

Because there is no specific law or regulatory framework for the management of ELVs in India, this country's implementation of ELVs and transition to a circular economy model have been influenced by policy instruments, regulation guidelines and governmental studies. These policy instruments are designed to fill in operational gaps not covered by the legal framework, encourage the development of formal

[29] LINDHQVIST, supra note 9, at 10–18.

recycling infrastructure and align environmental objectives with economic incentives. The operational effectiveness of these policy measures will ultimately depend on the consistency of regulations across all jurisdictions, institutional capabilities to enforce the regulations and the enforcement of the regulations themselves especially in urban areas where ELVs accumulate and informal recycling occurs.

A. National Vehicle Scrappage Policy, 2021

The National Vehicle Scrappage Policy, formally launched on 13 August 2021 as an executive policy initiative of the Government of India, seeks to systematically phase out old and polluting vehicles through mandatory fitness testing, voluntary scrappage incentives and the establishment of Authorised Vehicle Scrapping Facilities (AVSFs). Unlike a statutory enactment, the policy operates as a non-legislative policy instrument and therefore relies substantially on administrative implementation and state-level cooperation for its enforcement.[30]

To deregister and dispose of obsolete vehicles in a responsible way and improve urban air quality; improve road safety; increase fuel efficiency; and overall reflect a conceptual shift towards the circular economy (i.e., that an end-of-life vehicle (ELV) should be viewed as a resource of recoverable materials rather than just waste). Financial incentives, tax credits, bonus savings on the purchase of new vehicles are included within the vehicle scrapping policy to encourage participation and linking consumer behaviour with formally managed waste management systems.[31]

In spite of being progressive, the National Vehicle Scrappage Policy is limited in how well it can be enforced, largely because it does not require State governments to have binding statutory obligations to comply with the policy. The implementation of the policy is largely reliant on the voluntary participation of States and on administrative measures taken at the state level, which may lead to significant variations between states in how the policy is applied. Additionally, the policy does not adequately address the integration of Extended Producer Responsibility (EPR) into the ELV life cycle management framework, nor does it harmonize hazardous and electronic waste

[30] Ministry of Road Transport & Highways, Government of India, supra note 24, at 7–14.
[31] NITI Aayog, Strategy on Resource Efficiency in India 84–92 (2019).

regulation into a single, cohesive framework that will support the development of a cohesive ELV governance structure.[32]

B. NITI Aayog and Circular Economy Reports

NITI Aayog has contributed significantly to the ELV and circular economy policy discussions with its resource efficiency and circular economy reports. It highlights two of the highest material-intensive and recyclable areas, namely the automobile and metal sectors. NITI Aayog recommends developing formally recognized recycling ecosystems, improving material recovery rates and incorporating secondary raw materials into domestic manufacturing supply chains. It attempts to promote a more sustainable method of industrial manufacturing and to decrease our reliance on imported raw materials by framing ELV management as both an environmental imperative as well as an economic opportunity.[33] Nevertheless, most of the recommendations made by NITI Aayog remain at the level of policy intent and do not have any enforceability due to a lack of enabling legislation.

C. CPCB Guidelines on ELV Management

The Central Pollution Control Board (CPCB) has developed technical regulations through the Environment (Protection) Act to regulate the dismantling and recycling of ELVs at an operational level. These regulations include technical guidelines for the authorisation and operation of vehicle scrapping facilities; including depollution, waste separation, hazardous material storage and environmentally sound disposal of waste; as well as health and safety issues for employees carrying out dismantling activities. Thus, the CPCB's guidelines provide a framework for translating environmental principles into practical regulatory standards that apply to urban waste management systems.

Although CPCB guidance sets forth relevant principles for effective end-of-life vehicle (ELV) management, their non-enforceable nature and heavy reliance on implementation through State Pollution Control Boards will continue to impede or

[32] Sachin Chaturvedi, Circular Economy and India's Vehicle Scrappage Policy: Legal and Institutional Challenges, 5 INDIAN J. ENV'T L. & POL'Y 44, 49–56 (2022).
[33] NITI Aayog, supra note 29, at 84–92.

restrict any progress toward achieving consistent compliance across all states especially in urban settings dominated by informal dismantling sectors. In addition, CPCB guidelines do not address the much broader structural issues that need to be resolved in order for statutory regulations to promote effective ELV management including: integrating informal recyclers into the formal recycling process; coordinating across several government agencies involved in the recycling of ELVs; ensuring that producers are held accountable for recycling ELVs at their end of life; etc.[34]

While the presence of urban centre policies and regulatory guidelines in India generally suggests that policymakers are beginning to recognize the importance of ELV management as part of a comprehensive circular economy strategy, the lack of enforceability and fragmented implementation of the existing guidance highlights the significant need to develop an inclusive, comprehensive and legally enforceable framework to address these and all other obstacles to developing a successful national ELV management program. Absent such integration, the potential of effective ELV management as an important aspect of sustainable urbanization; improving the efficiency with which waste materials are managed; and enhancing the recovery of valuable resources will continue to be significantly under-utilized.

VIII. REGULATORY GAPS

In spite of the existence of policy initiatives, statutory frameworks and constitutional provisions, India's regulation of ELVs continues to be fragmented and insufficient. The current regulatory framework does not provide an integrated and lifecycle-based approach, leading to large gaps in institutional coordination, enforcement and accountability to stakeholders within the regulatory framework, which hampers the effective application of circular economy principles to ELV governance.

A. Absence of Dedicated ELV Legislation

Absence of dedicated legislation governs ELVs and remains an area of regulatory deficiency. Current legislation regarding ELVs consists solely of a fragmented set of

[34] Central Pollution Control Board, Guidelines for Environmentally Sound Management of End-of-Life Vehicles 4–12 (2019).

laws that apply as stand-alone and only address various issues around the management of ELVs (i.e., environmental laws; transport laws; waste management) with no requirement to be used together. The lack of a comprehensive law addressing the lifecycle of vehicles from the time of production until disposed of prevents a single regulatory body from being responsible for ensuring compliance at all levels of the ELV lifecycle (creating ambiguity in regulatory matter and diminishing accountability).

Further, the absence of statutory recognition of ELVs as a waste stream contributes to this lack of targeted legal obligations and standards and directly opposes the ability to implement circular economy principles which are dependent on an integrated and lifecycle regulatory framework. When comparing the EU's End-of-Life Vehicle Directive and the lack of a dedicated framework in India for regulating ELVs, the disparity is clear as ELV Directive contains a wide-ranging framework that mandates recycling, controls hazardous materials and holds producers legally accountable for ELVs. In India, such a framework does not exist, which significantly weakens India's ability to properly regulate ELVs.[35]

B. Dominance of Informal Recycling Sector

The continued dominance of informal recycling demonstrates an absence of effective enforcement of regulations. A large number of end-of-life vehicles (ELVs) are dismantled in unregulated scrapyards outside of the scope of environmental and labour laws - the use of dangerous methods for material extraction and improper disposal of hazardous materials both lead to environmental degradation and pose risks to public health.

The ongoing operation of these scrapyards can be attributed to a lack of regulatory oversight, limited number of authorised scrapping facilities and a lack of mechanisms to incorporate informal actors into the formal recycling system. Therefore, the reality of the regulations is that they do not govern actual practices as demonstrated by the absence of governance of informal recycling actors within the existing regulatory

[35] LAVANYA RAJAMANI, ENVIRONMENTAL GOVERNANCE IN INDIA 145–53 (Oxford Univ. Press, 1st ed. 2015).

framework. The gap between law and practice demonstrates an enforcement gap in the existing regulatory framework and highlights the inadequacy of the current regulations to facilitate a transition from informal to formal environmentally sustainable recycling systems.

To meet the formal integration of informal sector workers into regulated waste management systems, the International Labour Organization provides guidance for governments on creating training, licensing and social protection mechanisms. By not having any of these types of mechanisms available, India's ELV governance does not help to bring about the regulatory objectives that the government is pursuing with their rules and regulations and instead creates an even greater disconnect between what is done at the regulatory level and what happens in practice on the ground.[36]

C. Weak Enforcement Mechanisms

Another factor contributing to the inadequacies of the overall regulatory framework is the lack of efficiency in the enforcement mechanisms. Currently, various authorities (e.g., transportation, pollution control boards, municipal bodies) are responsible for different parts of the ELV Management process, but without any coordinated enforcement, there are overlapping jurisdictions and gaps in accountability.

As a result of these issues, there has been insufficient monitoring of deregistered vehicles, inadequate inspections of construction and demolition debris storage yards and limited adherence to environmental compliance. In urban areas, where there is the greatest volume of ELVs, the problem is amplified due to insufficient technical capabilities, resources and effective monitoring systems. As such, there are virtually no implemented legal provisions presently available affecting compliance with respect to ELV disposal, because of the lack of effective execution capability and consequently, they are not being met.[37]

[36] Madhu Agarwal, Role of Informal Sector in Solid Waste Management in India, 35 Int'l J. Env't Stud. 45, 49–54 (2015).
[37] Rakesh Kumar & Priti Maheshwari, Waste Management Regulation in India: Emerging Challenges, 7 INDIAN J. ENV'T PROT. 201, 207–13 (2018).

D. Inadequate Implementation of Extended Producer Responsibility (EPR)

A third gap evident in the development of policies and practices to encourage better environmental protection/reduced carbon use is that of EPR for the automobile sector. While EPR in other waste streams has been successfully established, EPR as part of ELV regulation remains largely unregulated and unenforceable.

Specifically, automobile manufacturers do not have a clear set of statutory obligations to collect, recycle or otherwise manage end-of-life (EOL) vehicles. The absence of EPR for the automobile industry places the financial burden for managing EOL vehicles on informal recyclers and regulatory authorities. As a result, there are no incentives for manufacturers to design vehicles that are easier to recycle or to develop formal recycling programmes. The absence of an EPR framework has created a significant gap in the successful implementation of lifecycle governance and circular economy objectives.

The OECD's Extended Producer Responsibility Guidelines are an internationally recognized best practice, creating an obligation for producers to take over the financial and operational responsibilities for end-of-life management of discarded products. Therefore, without such legally binding obligations being placed upon Indian automobile producers, EPR will not be an effective regulatory mechanism.

E. Lack of Institutional Coordination

Many regulatory entities govern ELVs, yet gaps exist due to insufficient coordination within their separate legal realms of responsibility. As such, registrars (transport authorities) process vehicle registrations and deregistration; however, this function is not well integrated with the waste management function of environmental agencies, which creates a severance between the two functions.

Poor data sharing limits the ability to trace each vehicle from the time of deregistration until it is finally disposed of without an integrated monitoring system there can be no assurance that compliance exists, that illegal dismantling is prevented or that environmental standards are enforced in short, the institutional fragmentation of ELV

governance is not only weak but also demonstrates a failure to properly design a regulatory system.

F. Structural Deficiencies

The cumulative effect of these shortcomings indicates a more widespread systemic weakness within the existing framework for continuing regulation of ELVs in India. The regulatory framework has numerous shortcomings, including fragmented regulatory authority, weak regulation through enforcement and no lifecycle approach to ELVs. Rather than managing the value of ELVs as a resource in a circular economy in a proactive fashion, the regulatory framework is still operating in a reactive manner and continues to only address isolated regulatory interventions.

The result of this is not only negative environmental impacts, but also the loss of recyclable, valuable resources and economic inefficiencies. Therefore, in order to solve the challenges posed by ELVs, the existing regulatory framework cannot adequately address the complex issues associated with ELVs and comprehensive reforms to both legal and institutional frameworks are essential to establish sustainable and effective governance of ELVs.[38]

IX. HYPOTHESIS VALIDATION

Hypothesis 1: *"The current legal framework concerning End-of-Life Vehicles in India is fragmented and inadequate resulting in inefficient regulation."*

Hypothesis 1 has been conclusively supported by the findings of this research. The lack of a comprehensive ELV law and the prevalence of overlapping laws demonstrates how fragmented our current system is. It is also evident that inefficiencies in regulations due to inadequate enforcement mechanisms; insufficient institutional collaboration among regulators and recyclers; and high levels of informal recycling. The evidence from this research indicates that current legislation does not adequately regulate, monitor or safely dispose of ELVs. Thus, we conclude that the current legal system is insufficient and ineffective in fulfilling its intended goals.

[38] Sachin Chaturvedi, Circular Economy and India's Vehicle Scrappage Policy: Legal and Institutional Challenges, 5 INDIAN J. ENV'T L. & POL'Y 44, 49–56 (2022).

Hypothesis 2: *"The absence of a comprehensive legal framework incorporating circular economy principles and Extended Producer Responsibility significantly hinders sustainable ELV management in India."*

The analysis provided by this study demonstrate that hypothesis 2 is well supported. The combination of insufficient legislative recognition of circular economy approaches and poor application of Extended Producer Responsibility (EPR) within the motor vehicle sector has severely impacted sustainable management of ELVs in India. The absence of lifecycle-based regulation, limited manufacturer incentives and the absence of well-developed formal recycling processes have caused significant environmental impacts, resource inefficiency and continued use of informal methods. Within this context, it is clear that without introducing circular economy-approaches and EPR into a legally binding framework, the sustainable management of ELVs will remain impossible.

Therefore, validation of both hypothesis shows that the difficulties faced by Indian ELV management are not simply operational, she also shows that the obstacles stem from the fact that there are structural and legal issues to be addressed. This study highlights that there is an urgent need for an integrated, comprehensive and enforceable Legal Framework that will enable environmental protection to coordinate with the efficient use of natural resources through the implementation of Circular Economy principles. Only with a radical change to the current fragmented and reactive governance structure can ELV Governance Shift from its current fragmented and reactive operating model towards a sustainable and lifecycle based regulatory system.

X. SUGGESTIONS AND RECOMMENDATIONS

In order to address the challenges of End-of-Life Vehicle (ELV) management in India, it is necessary to adopt a holistic approach to ELV governance through legislative, policy, institutional and behavioural reforms. The current fragmented situation calls for an integrated strategy to align ELV governance with circular economic principles and sustainable urbanisation.

The first step toward reform is the creation of a dedicated, comprehensive ELV law that will consolidate the fragmented laws that currently exist between environmental law, transport law and waste management law. The new law will take an entire lifecycle approach to managing ELVs; this means that it will incorporate circular economy principles at every stage of an ELV's lifecycle from design to end of life (i.e. including dismantling, recycling and recovering materials). The law must also clearly define all responsibilities of all parties involved in the ELV lifecycle (i.e. including manufacturers, vehicle owners, recyclers and regulators) and establish enforceable compliance mechanisms. Finally, the law must fully incorporate ELVs into municipal/industrial waste management systems; this acknowledges that ELVs represent a substantial portion of municipal and industrial wastes.

The automobile industry's expanded producer responsibility (EPR) plan must be reinforced and formalized throughout the automobile sector. A legally binding producer responsibility system would require manufacturers to collect, recycle and manage ELVs, including hazardous and electronic components, in an environmentally safe manner. That would encourage manufacturers to design their vehicles to be more sustainable, decrease the need for informal dismantling of ELVs and provide a foundation for formal recycling infrastructure development. In addition, incorporating EPR into ELV regulation will improve resource efficiency by ensuring that valuable materials are recovered and returned to the production cycle.

The formalization of the informal recycling industry is another key reform area. Because the bulk of informal recycling occurs in urban and peri-urban centers, programs should be designed to institutionalize these activities, with a licensing system, requirements for compliance with environmental and safety regulations and programs to develop the skills of individuals working in the informal sector. By creating pathways for informal workers to enter the formal economy, environmental and occupational risks will be reduced, material recovery will be improved, and the overall framework of a circular economy will be strengthened.

Coordinated institutional efforts between key regulatory organisms including Ministry of Road Transport and Highways (MoRTH) and Ministry of Environment,

Forest and Climate Change (MoEFCC), as well as the Central Pollution Control Board (CPCB), are necessary to achieve effective ELV governance. Fragmentation in regulatory responsibilities creates barriers to data sharing, monitoring and enforcement. A coordinated approach (i.e., an integrated digital vehicle tracking/ deregistration; scrappage system) would improve transparency and provide for consistent application of environmental standards across jurisdictions, particularly in urban areas where regulatory agencies face the greatest challenges.

Public participation and behaviour change are also integral to achieving successful ELV policies. Public awareness campaigns should be conducted to inform vehicle owners of the environmental/economic benefits of allowing authorised scrappage practice. Economic incentives (i.e., financial rewards such as tax credits/subsidies) can also be used to encourage greater public participation in formal recycling systems. By aligning consumer incentives with environmental objectives; the transition to circular economies will be accelerated while concurrently reducing the environmental and human health impacts from informal dismantlers.

As a whole, these suggestions create an integrated framework to better the enforcement of ELV regulations in India. India will be able to implement circular economy principles with their statutory laws and policy objectives together and enforce the principles through legally binding enforcement methods. These reforms will not only improve environmental outcomes; they will also contribute to more cities evolving sustainably and achieving resource-efficient processes in their economies.

It is important that regulations governing ELVs conform to international environmental norms like those developed by the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989) and analogues like the European Union's End-of-Life Vehicles Directive. These documents have established models for combining environmental protection with efficient utilisation of resources; therefore, having comparable legislation will improve the efficiency, enforceability and compatibility of India's ELV governing framework globally.

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XI. CONCLUSION

In India, ELVs have progressed from just being technical/environmental issues to becoming an essential part of sustainable urban management, efficient use of resources and protecting the health of the public. This research shows that even though there are constitutional requirements and laws regulating the environment, the fact that they have been implemented sporadically has reduced India's ability to achieve the full potential of a circular economy in the automotive industry. Without having one complete or integrated legal system in place, it continues to make it difficult to manage ELV lifecycle appropriately and urban areas produce the most waste and experience the pressure of the environment.

To overcome the challenges identified, a more cohesive legal/institutional approach to managing ELVs is needed, which should include the enactment of a separate ELV law, a legally enforceable EPR system and moving informal recyclers into a formalized waste management process. Additionally, inter-agency coordination needs to be enhanced and incentives to encourage consumer involvement should also be provided in order to properly implement and comply with regulatory compliance in all areas of the country.

The governance of ELVs should not only focus on the protection of the environment but should also be used to transform urbanization in terms of promoting sustainable practices associated with the recovery of resources, reduction of environmental harm and the development and life cycle management of vehicles that are sustainable. In doing so, India can reduce its reliance on primary raw material and move towards the development of green industries.

The ongoing integration of the principles of circularity into the ELV policy framework indicates a changing paradigm of the relationship between the economy and the environment (the restoration approach), wherein "waste" is no longer regarded as waste but as "an asset" and the environmental consequences of harm are being addressed by systematic recovery and reuse. In order to align economic development with ecological sustainability, it will be necessary to establish legally binding and institutionally coordinated infrastructure to implement this system of governance. By

creating an environmentally responsible governance system to manage ELVs, India has the capacity to convert the growing challenge faced with ELVs into an opportunity for promoting sustainable development and to become a model for other developing economies facing similar sustainability challenges due to urbanization. Consequently, connecting India's ELV regulatory framework with global environmental instruments and circular economy regulations is needed to close legal gaps and establish a sustainable, effective and internationally consistent system for managing ELVs.

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