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ABSTRACT

Despite being the largest vehicle owner in the world, China faces significant challenges with its end-of-life vehicle (ELV) management. In its early stages, Chinese ELV legislation focused primarily on simple metal recycling, with limited consideration for environmental and industrial synergies. Apart from improving the environment, ELV formal management can also bring many benefits to the vehicle industry. However, these benefits are accompanied by challenges. This research provides a comprehensive review of the Chinese ELV legal Framework to clarify the direction and focus of ELV lawmaking. Specifically, this research reviews and analyses Chinese ELV management over an extended 20-year period, from law and policy making by the central government. The core sections identify three problems related to the whole ELV legal framework based on the life cycle thinking approach.

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1. INTRODUCTION

The level of maturity in recycling discarded vehicles is higher in developed countries, where the average recycling rate is between 6 percent and 8 percent of the total vehicles.[1] In contrast, China's end-of-life vehicle (ELV) recycling industry is still in its infancy.[2] China has the largest number of vehicles in the world.[3] Even in the emerging electric vehicle market, more than half of the world's electric vehicles are in China.[4] A high number of vehicles inevitably leads to a high number of ELVs. However, the average vehicle lifetime is 10-15 years.[5] The ELV recycling rate in China is concerning, with relatively few ELVs being processed through formal ELV recycling companies. Approximately 75 percent of vehicles are reused illegally or dismantled in an unregulated manner.[6] Most ELVs are turned into low-value products like screws and cans, with only about 25 percent being legally recycled.[7]

ELV regulations sometimes deviate from their pro-environmental problems, focusing on the expansion of ELV dismantling companies regardless of actual social demand and systemic issues in the recycling sector. The number of ELVs may not be sufficient to meet the demands of all ELV disposal companies. As a result, new and small-sized ELV disposal companies may struggle to make a profit. Therefore, future ELV policy can be more effective by providing incentives for improving vehicle repairability. Encouraging green design based on a life cycle thinking approach could be a new legislative direction for the Chinese government.

ELV recycling has gained increasing attention in Chinese vehicle research. Various factors influence ELV recycling, and researchers approach the issue from different angles, resulting in fragmented and uncoordinated studies.[8] This article,

1 Kamilė Petrauskienė, Rasa Tverskytė and Jolanta Dvarionienė, 'Environmental and Economic Benefits of Electric, Hybrid and Conventional Vehicle Treatment: A Case Study of Lithuania' (2022) 140 Waste Management 55.

2 Lei Wang and others, 'Automobile Recycling for Remanufacturing in China: A Systematic Review on Recycling Legislations, Models and Methods' (2023) 36 Sustainable Production and Consumption 369.

3 National Bureau of Statistics, Automobile Ownership in China Since 2015.

4 Yong Choi and Seung-Whee Rhee, 'Current Status and Perspectives on Recycling of End-of-Life Battery of Electric Vehicle in Korea (Republic Of)' (2020) 106 Waste Management 261.

5 Jihu Zheng and others, 'Survival Rate of China Passenger Vehicles: A Data-Driven Approach' (2019) 129 Energy Policy 587.

6 Wenchao Li and others, 'Life Cycle Assessment of End-of-Life Vehicle Recycling Processes in China—Take Corolla Taxis for Example' (2016) 117 Journal of Cleaner Production 176.

7 Chunliang Zhang and Ming Chen, 'Designing and Verifying a Disassembly Line Approach to Cope with the Upsurge of End-of-Life Vehicles in China' (2018) 76 Waste Management 697.

8 Solange Ayuni Numfor and others, 'A Review of Challenges and Opportunities for End-of-Life Vehicle Recycling in Developing Countries and Emerging Economies: A SWOT Analysis' (2021) 13(9) Sustainability 4918. Vi Kie Soo and others, 'The Influence of End-of-Life Regulation on Vehicle Material Circularity: A Comparison of Europe, Japan, Australia and the US' (2021) 168 Resources, Conservation and Recycling 105294; Swapnil Lahane, Ravi Kant and Ravi Shankar, 'Circular Supply Chain Management: A State-of-Art Review and Future Opportunities' (2020) 258 Journal of Cleaner Production 120859; Ehsan Shekarian, 'A Review of Factors Affecting Closed-Loop Supply Chain Models' (2020) 253 Journal of Cleaner Production 119823.

therefore, conducts comprehensive legal research on China's ELV management to promote a circular economy (CE) in the vehicle industry. Specifically, Section 2 analyses the core legal and regulatory instruments governing ELV management in China, highlighting their structure and policy orientation. Section 3 identifies three problems in the ELV legal framework, based on the life cycle thinking approach.

2. THE LEGAL FRAMEWORK FOR END-OF-LIFE VEHICLES IN CHINA

2.1 Introduction

China's ELV legislation adopted a developmental approach, empowering government departments responsible for industrial affairs to formulate and implement ELV-related policies. These departments employ macroeconomic measures to restructure the industry and advance CE goals. ELV-related regulations are dispersed across various laws, including environmental, resources, and industry laws, with relevant provisions also appearing in civil and commercial legislation. Prior to the 2000s, the primary objective of ELV recycling in China was to secure supplementary metal resources. Since then, specialised policies and laws addressing ELV management and technological standards have been progressively introduced.

To regulate ELV recycling and mitigate the environmental impacts of ELV pollution, the State Council (SC) issued the Management Rules of End-of-life Vehicles Take-Back, which came into being in 2001 and was invalid in 2019.[9] These rules primarily set access requirements for the ELV recycling business, stipulating that eligible companies must have no record of illegal activity and must comply with national environmental protection standards. In the interest of safety, the rules aim to regulate ELV recycling practices and restrict the dismantling and resale of pieced-together vehicles.

In 2006, the National Development and Reform Commission (NDRC) and the State Environmental Protection Administration jointly issued the Technology Policy for Auto Products Recycling (hereinafter 'Technology Policy').[10] This policy emphasised strengthening the management of the vehicle manufacturers' responsibilities and incorporating recyclability rates into the vehicle market access system. It also sets target recovery and recycling rates at various stages of the vehicle lifecycle.[11]

By 2010, China had 78.2 million vehicles in use, with an estimated 4.8 million classified as ELVs.[12] In 2012, the

[9] SC, 报废汽车回收管理办法 (End-of-Life Vehicle Recycling Regulations); effective on 16 June 2001; invalid on 1 June 2019 <https://www.gov.cn/gongbao/content/2001/content_60919.htm> accessed in February 2024.

[10] NDRC et al., 汽车产品回收技术政策 (Technology Policy for Auto Products Recycling); effective on 6 February 2006 <https://www.mee.gov.cn/ywgz/fgbz/bz/bzwb/wrfzjszc/200611/t20061120_96237.shtml> accessed in February 2024.

[11] Article 10 of Technology Policy for Auto Product Recycling.

[12] Lu Wang and Ming Chen, 'Policies and Perspective on End-of-Life Vehicles in China' (2013) 44 Journal of Cleaner Production 168.

government introduced the Interim Measures for the Administration of Subsidies for Scrapping and Renewal of Old Automobiles to encourage the formal recycling of ELVs.[13] According to the China Renewal Association, only 1.592 million ELVs were recycled through licensed ELV disposal companies in 2016, with around 40 ELV disposal companies having an annual dismantling capacity of over 10000 vehicles.[14] However, the total number of formal ELV disposal companies is 635. Meanwhile, the ELV 'black market' is booming, and around 30 percent of ELVs are recovered through formal channels.[15]

In 2019, China introduced its most important administrative regulation on ELV management to date: the Measures for the Administration of Recycling and Utilisation of Scrap Motor Vehicles (hereinafter 'Measures Administration'). Subsequently, seven administrative agencies jointly promulgated the Detailed Rules for Implementing End-of-Life Vehicle Collection Management Measures (hereinafter 'Detailed Rules'[16]).[17] These rules require the government to promote the development of the ELV collection and disposal industry. With the support of this regulatory framework, the number of licensed ELV disposal businesses increased from 635 in 2016 to 929 in 2021.[18] The ELV disposal industry in China is now expected to engage a wide range of stakeholders involved in both commercial dismantling and vehicle renovation activities.

In addition, China has developed a series of five-year, medium and long-term plans that outline guidelines and objectives for the CE within the vehicle industry. These national plans hold a special status within the ELV legal and policy framework and, in some cases, have proven more effective in implementation than formal legislation. As a result, China has established a relatively comprehensive legal system for ELV recycling, primarily based on the Measures Administration

13 Zhang Yu, Ma Tianshan and Syed Abdul Rehman Khan, 'Investigating the Effect of Government Subsidies on End-of-Life Vehicle Recycling' (2021) 39 Waste Management & Research 860, 860.

14 Chyxx.com, 行业调研 2019 年中国报废汽车回收数量、回收车辆结构、回收价值及发展趋势分析 (Industry Channel Analysis on the number, structure, value and development trend of ELVs in China in 2019; published in 2020 <http://www.chyxx.com/industry/202003/839007.html> accessd in February 2024

15 Yuanhua Chen and others, 'Analysis and Countermeasures for the Status Quo of the Recycling and Utilization of End-of-Life Vehicles in China' (2018) 20 Strategic Study of Chinese Academy of Engineering 113.

16 The Detailed Rules for Implementing End-of-Life Vehicle Collection Management Measures is a subsidiary administrative instrument issued by [Ministry], designed to operationalise the implementation of ministerial regulations. Although binding within administrative procedures, it does not have the status of departmental regulations under the Legislation Law of China.

17 Ministry of Commerce and others, 报废机动车回收管理办法实施细则 (Detailed Rules for Implementing End-of-Life Vehicle (ELV) Collection Management Measures); effective on 1 September 2020 <https://www.gov.cn/zhengce/zhengceku/2020-08/02/content_5531960.htm> accessed in February 2024. The original Chinese legal context could be seen in Annex IV.

18 中国再生资源回收行业 2021 年发展报告 (Chinese Renewable Resource Recycling Industry Development Report 2021) <http://www.crra.com.cn/detail/9941> accessed in February 2024.

and supplemented by other related laws and policies (Table 1[19]).

Table 1 Current Laws and Regulations of ELV Management

Year	Name of Laws or Regulations
2001	Detailed rules for take-back of end-of-life vehicles
2006	Technical policy for automotive products recycling
2008	Fourteen enterprises as pilot remanufacturers of automotive parts
2013	Trade-old-for-remanufactured automotive parts
2014	Draft specification for dismantling vehicle manual
2019	Measures for the administration of the recycling and utilisation of scrap motor vehicles
2019	New energy vehicle waste power battery comprehensive utilisation industry specifications
2020	Detailed rules for the implementation of the measures for the administration of the recycling of end-of-life motor vehicles
2021	Interim measures for the administration of the remanufacturing of motor vehicle parts and components
2021	The pilot implementation program of automobile product producer responsibility extension
2022	The 14th five-year plan for circular economy development

[19] Hui Liu, Lulu Ye and Jianan Sun, 'Automotive Parts Remanufacturing Models: Consequences for ELV Take-Back under Government Regulations' (2023) 416 Journal of Cleaner Production 137760.

2.2 ELV Legal Framework in China

ELV recycling regulations in China fall under the domain of environmental law and require stakeholders to reduce environmental pollution caused by end-of-life vehicles.[20] Within the Chinese legal framework, ELV-related legislation can be issued at both central and local levels, and it also applies to broad local legislation.[21] This research examines local legislative processes in detail. Due to the hierarchical structure of the Chinese legal system, the legal implications of rules enacted by various agencies may differ.

At the central level, ELV legislation in China is more closely associated with CE policies than traditional environmental laws. For example, the Solid Waste Pollution Prevention and Control Law (hereinafter 'Solid Waste Law')[22] and Cleaner Production Promotion Law[23] primarily aim to reduce pollution and waste generation during production and disposal processes.

In 2019, the SC issued the Measures Administration to further implement national legislation on ELV recycling. Building on this framework, the Ministry of Commerce has issued a series of departmental regulations to specify the detailed requirements for implementation. Meanwhile, ministries jointly issued the Measures for the Regulation and Administration of Automotive Parts Remanufacturing to promote professional repair and remanufacturing of ELV components and to enhance quality standards in the sector.[24]

2.2.1 Relevant Legislation with ELV Management

At the central level, China has issued various policies to promote general environmental compliance, with the Circular Economy Promotion Law (hereinafter 'CE Law') serving as a guiding framework for ELV recycling systems.[25]

[20] SC, 报废机动车回收管理办法 (The Measures for the Management of End-of-Life Vehicle Recycling), effective on 1 June 2019 <https://www.gov.cn/zhengce/content/2019-05/06/content_5389079.htm> Art 1; accessed in March 2024.

[21] NPC, 中华人民共和国立法法 (Legislation Law of the People's Republic of China), effective on 15 March 2000, last amended in 2023; Chapter IV, Section 1 <http://en.moj.gov.cn/2023-12/15/c_948358.htm> accessed in February 2024.

[22] NPCSC, 中华人民共和国固体废物污染环境防治法 (Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Wastes); effective in 1996; last amended in 2020 <https://www.mee.gov.cn/ywgz/fgbz/fl/202004/t20200430_777580.shtml> accessed in March 2024.

[23] NPCSC, 中华人民共和国清洁生产促进法 (Cleaner Production Promotion Law of the People's Republic of China); effective in 2012; last amended in 2012 <https://www.mee.gov.cn/ywgz/fgbz/fl/201904/t20190428_701287.shtml> accessed in March 2024.

[24] NDRC and others, 汽车零部件再制造规范管理暂行办法 (Measures for the Regulation and Administration of Automotive Parts Remanufacturing); effective on 14 May 2021 <https://www.gov.cn/zhengce/zhengceku/2021-04/25/content_5601957.htm> accessed in March 2024.

[25] NPCSC, 循环经济促进法 (Circular Economy Promotion Law); effective on 1 January 2009; last amended in 2018 <http://www.npc.gov.cn/zgrdw/npc/xinwen/2018-11/05/content_2065669.htm> accessed in March 2024.

Unlike the Environmental Protection Law, which offers limited guidance on CE matters, the CE focuses on improving resourcing efficiency.[26] It mandates the formal recycling of ELVs and encourages the professional repair of vehicle parts.[27] In addition to these general provisions, the CE Law also assigns specific responsibilities to the government authorities.[28] However, as its primary function is to guide and promote CE development, the law lacks effective coercive mechanisms, which impact its enforcement. Moreover, since the CE Law emphasises source reduction over pollution control, it places greater responsibility for recycling on vehicle manufacturers, thereby increasing their production burden.

Most materials generated from ELV disposal are classified as solid waste and therefore fall under the regulatory scope of the Solid Waste Law.[29] This law provides a comprehensive national framework for the management of hazardous, municipal, and industrial solid waste.[30] Its goals are to prevent and control environmental pollution by solid waste, safeguard human health, and promote the goals of socialist modernisation.[31] The Solid Waste law emphasises the prevention of harm caused by 'pollutants' and the safe disposal of solid waste, both of which reflect an end-of-life governance model.[32]

The Cleaner Production Promotion Law (2012 Amendment) puts two key policy measures to incentivise vehicle manufacturers to participate in ELV recycling systems.[33] First, it mandates an information disclosure obligation on manufacturers.[34] Enterprises producing motor-driven means of transport must adhere to technical specifications laid down by the department for standardisation under the SC or the authorised institutions, and must indicate the standard brand and material composition on major vehicle components. This requirement helps to reduce information gaps between manufacturers and consumers. Second, this law provides a legal basis for an extended producer

26 NPCSC, 中华人民共和国环境保护法 2014 (Environmental Protection Law of the People's Republic of China 2014), effective in 1989; last amended in 2014 <https://www.mee.gov.cn/ywgz/fgbz/fl/201404/t20140425_271040.shtml> Article 29 accessed in March 2024.

27 ibid.

28 ibid

29 NPCSC, 中华人民共和国固体废物污染环境防治法 (Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Wastes); effective in 1996; last amended in 2020 <https://www.mee.gov.cn/ywgz/fgbz/fl/202004/t20200430_777580.shtml> accessed in March 2024.

30 ibid, Art1.

31 ibid.

32 Chen Ting, '固体废物污染环境防治法》修订:实施现状、观念检视与立法重构' (Revision of the Law on the Prevention and Control of Environmental Pollution by Solid Waste: Implementation Status, Conceptual Review and Legislative Reconstruction) (2019) (00) 环境法评论 (Environmental Law Review) 135-58.

33 NPCSC, 中华人民共和国清洁生产促进法 (Cleaner Production Promotion Law of the People's Republic of China); effective in 2003; last amended in 2012 <https://www.mee.gov.cn/ywgz/fgbz/fl/201904/t20190428_701287.shtml> accessed in March 2024.

34 ibid, Art 21.

responsibility (EPR) policy applicable to manufacturers.[35] However, it lacks detailed provisions regarding implementation and enforcement.

The Environmental Impact Assessment Law is particularly relevant for ELV disposal companies, as it requires them to minimise environmental harm, especially in ecologically sensitive areas.[36] Waste disposal has contributed to increasing land contamination and groundwater pollution in China.[37] ELV disposal companies are therefore obligated to store and dispose of waste in compliance with environmental standards.[38] These companies are also subject to project-level environmental impact assessment. It also specifies what must be evaluated, when the environmental impact assessment must be carried out, and who oversees it.[39] While central legislation generally provides limited details on policy implementation, it mandates that all ELV disposal activities comply with environmental standards; failure to do so results in administrative penalties.

2.2.2 Central Administrative Regulations

The Measures Administration serves as the core regulatory instrument shaping the current ELV recycling system in China. The administrative regulation aims to improve the ELV recycling rate and promote CE.[40] Comprising 28 articles, it addresses the use of market instruments, environmental standards setting and stakeholder responsibilities, while also outlining policies to modernise the ELV governance framework. One of the most significant changes introduced by the Measures Administration is the transition of ELV recycling from a highly regulated, specialised sector to a market-driven industry. Before 2019, only one licensed ELV disposal enterprise was permitted to operate within the jurisdiction of each prefecture-level city, effectively establishing a regional monopoly. The new administrative regulation dismantles this monopoly and removes barriers to private capital entry.[41] It also stipulates

35 ibid, Art 20.

36 NPCSC, 中华人民共和国环境影响评价法 (Environmental Impacts Assessment Law of the People's Republic of China), issued on October 28, 2002; amended on 2 July 2016 <https://www.mee.gov.cn/ywgz/fgbz/fl/201901/t20190111_689247.shtml> accessed in December 2024.

37 MEP & MLR, '全国土壤污染状况调查公报' (Report on the contaminated land in China), MEP Report on 17 April 2017, full text available at <http://www.zhb.gov.cn/gkml/hbb/qt/201404/W020140417558995804588.pdf> 4 accessed in March 2024.

38 NPCSC, 中华人民共和国固体废物污染环境防治法 (Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Wastes); effective in 1996; last amended in 2020 <https://www.mee.gov.cn/ywgz/fgbz/fl/202004/t20200430_777580.shtml> accessed in March 2024.

39 NPCSC, 中华人民共和国环境影响评价法 (Environmental Impacts Assessment Law of the People's Republic of China), issued on 28 October 2002; amended on 2 July 2016 <https://www.mee.gov.cn/ywgz/fgbz/fl/201901/t20190111_689247.shtml> chapter 3, accessed in December 2024.

40 SC, 报废机动车回收管理办法 (Measures for the Management of End-of-Life Vehicle Recycling); effective on 1 June 2019; Art 1.

41 ibid, Art 5.

that ELVs are no longer recycled based on scrap metal prices but can be traded at market prices. Another major change involves the establishment of a mandatory certification system for ELV disposal companies. These companies are now required to comply with environmental protection standards concerning storage facilities, dismantling sites, equipment, and operational procedures.[42] This reflects a shift in regulatory emphasis, from centralised planning to compliance with environmental performance standards.

The Measures Administration also encourages vehicle manufacturers to engage in the ELV recycling business and take on EPR.[43] It implements an information disclosure policy to promote the remanufacturing and utilisation of ELV parts. ELV disposal companies are required to submit annual information on the 'Five Main Assemblies' (engine, steering system, transmission, front and rear axles, and chassis), identifying those eligible for remanufacturing and resale to certified companies.[44]

Although the administrative regulation promotes ELV recycling among various stakeholders, it does not impose a direct legal obligation on manufacturers to recycle. It provides that the State shall supervise ELV recycling and dismantling activities, with the SC holding primary responsibility for oversight at the national level.[45] However, the government management of the ELV recycling industry is less effective than regulatory in all aspects of the vehicle product life cycle, and intervention at the source ensures the recycling efficiency of automobiles after they are scrapped.

2.2.3 Normative Instruments

The regulatory framework governing ELV recycling in China is primarily composed of department regulations and normative instruments issued by a range of central authorities, including the Ministry of Commerce, National Development and Reform Commission, Ministry of Industry and Information Technology, Ministry of Public Security, Ministry of Ecology and Environment, Ministry of Transport, and State Administration for Market Regulation.[46] Compliance with ELV-related requirements is mainly achieved through a combination of administrative licensing procedures, environmental impact assessments (EIAs), and national technical standards.

According to the Detailed Rules for Implementing End-of-Life Vehicle Collection Management Measures (Detailed Rules), administrative authorities are required to conduct qualification assessments for all ELV dismantling and disposal enterprises.[47] ELV disposal stakeholders, primarily these companies, must complete construction EIAs under the Environmental Impact Assessment Law and submit the reports to the competent environmental authorities.[48] Where required environmental protection measures are not properly implemented, regulators may order corrective actions within a specified period or revoke the company's qualification certificate in cases of continued non-compliance.[49]

[42] ibid, Art 7.

[43] ibid, Art 5.

[44] ibid, Art 12.

[45] ibid, Art 4.

[46] Ministry of Commerce and others (n17).

[47] ibid, Art 7.

[48] ibid, Arts 8 and 9.

[49] ibid, Art 34.

The Detail Rules also incorporate third-party evaluation mechanisms into the licensing process. ELV disposal companies must engage certified environmental assessment agencies to carry out the evaluation, which is then submitted to the authorities for review.[50] These agencies are subject to a regulatory credibility system, and any falsification or manipulation of assessment results may result in sanctions or public disclosure of negative records.

In addition to EIA procedures, national technical standards constitute an essential regulatory reference in the governance of ELV recycling. Two key standards are GB 22128-2019 (Technical Specifications for End-of-Life Vehicles Recycling and Dismantling Enterprises)[51] and HJ 348-2022 (Technical Specifications for Pollution Control for End-of-Life Vehicles Dismantling Enterprises).[52] These standards set detailed requirements for site management, dismantling processes, and pollution control regarding air, water, soil, and noise. Although these standards are binding when incorporated into administrative licensing or enforcement procedures, they are not self-executing and do not independently confer legal rights or obligations. Rather, they function as high-level technical administrative norms whose enforceability depends on their invocation by competent authorities.[53]

[50] ibid, Art 9.

[51] Ministry of Commerce, 报废汽车回收拆解企业技术规范 (Technical Specifications for End-of-Life Vehicles Recycling and Dismantling Enterprise), effective in 2009, amended in 2019 <http://www.mofcom.gov.cn/article/b/d/201912/20191202923961.shtml> accessed in March 2024.

[52] ibid.

[53] 方俊; Fang Jun, '论我国法院对环境标准的司法审查' (2024) 45 Judicial Examination of Environmental Standards in Chinese Courts 76.

2.3 Principle for Prevention of Environmental Pollution by ELV

2.3.1 Integration of the 3R Principle in ELV Environmental Regulation

It is widely recognised that the management and regulation of ELVs should be guided by the '3R' principle (reduce, reuse, and recycle), which lies at the core of circular economy (CE) strategies.[54] The comprehensive and rational use of ELVs is a key component of the CE, serving as both a strategy to mitigate the resource crisis and an economic incentive to prevent pollution by solid wastes.

While Chinese ELV-related legislation does not explicitly refer to the 3R principle, its core elements are reflected in broader environmental legislation. Article 4 of the Solid Waste Law establishes the foundational legal basis for the 3R approach by stating: 'The State shall, in preventing and controlling environmental pollution by solid waste, implement the principles of reducing the discharge of solid waste, fully and rationally utilising solid waste, and making it hazardless through treatment'. This provision establishes the legal and normative basis for the integration of the 3R principle into subsequent sectoral regulatory frameworks, notably those concerning ELVs.

In practice, the 3R principle is operationalised through multiple legal and regulatory mechanisms. First, a

[54] Chun-Li Peng, Domenic E Scorpio and Charles J Kibert, 'Strategies for Successful Construction and Demolition Waste Recycling Operations' (1997) 15(1) Construction Management & Economics 49.

combination of economic and technical requirements has been introduced to promote the comprehensive recovery and recycling of ELV components. Second, existing regulatory measures encourage manufacturers to support ELV take-back and recycling efforts, particularly through design improvements and coordination with licensed recyclers. Third, ELV management is indirectly linked with broader policy frameworks on urban planning, industrial development, and land use, which together enable the allocation of space and infrastructure for environmentally sound disposal and reuse. In sum, the 3R Principle serves as a valuable guideline for creating regulations to prevent environmental damage from ELVs. By following this guideline, pollution can be minimised, the environment can be improved, and resources can be saved and used efficiently.

2.3.2 Principle of Life Cycle Thinking on ELV Management

Environmental pollution associated with vehicles can occur across various life cycle stages, including production, collection, storage, transportation, use, and eventual disposal. In this context, the adoption of a life cycle thinking approach is essential for comprehensive and forward-looking ELV management. The legal basis of this principle can be found in Articles 16 and 17 of the Solid Waste Law.[55] The fundamental idea behind this concept is that to achieve the comprehensive standard, each stage should adopt appropriate criteria based on the unique characteristics of various wastes.

ELV recycling should not be narrowly defined as the treatment of materials after vehicle scraping. Instead, resource recovery involves multiple interlinked stages, including vehicle design, use, decommissioning, and parts remanufacturing. Therefore, a life cycle-based governance model is needed, one that assigns responsibilities to relevant stakeholders along the value chain. However, current ELV regulations in China lack a coherent responsibility-sharing mechanism based on life cycle stages. Manufacturers' obligations concerning upstream source prevention and downstream disposal remain vague or absent.

EPR was first proposed for e-waste management in China in 2002 and was later formalised in the CE Law.[56] The 2006 Technical Policy for Automotive Products Recovery generally outlines some responsibilities that manufacturers should assume during the production stages. However, this policy cannot be implemented effectively due to its vague content and poor enforcement.[57] As stakeholders aim to maximise their interests, vehicle manufacturers are unlikely to proactively adopt green

[55] They regulated that organizations and individuals causing solid waste shall adopt corresponding measures to prevent or reduce environmental pollution of solid waste. Also, organisations and individuals responsible for collecting, storing, transporting, using, and disposing of solid wastes shall adopt measures to prevent environmental pollution as against scattering, drainage, filtration, or others who shall not topple over, pile up, abandon, or involuntarily discharge solid wastes.

[56] Bruno Milanez and Ton Bührs, 'Extended Producer Responsibility in Brazil: The Case of Tyre Waste' (2009) 17(6) Journal of Cleaner Production 608.

[57] NDRC, 汽车产品回收利用政策 (Technical Policy for the Automotive Products Recovery); effective in 2006 <https://www.mee.gov.cn/ywgz/fgbz/bz/bzwb/wrfzjszc/200611/t20061120_96237.shtml> accessed in March 2024.

design and clean production measures, particularly in recycling. Consequently, it is challenging to prevent and intervene in the recycling and disposal from the source stage.

In 2017, the Implementation Plan for the Extended Producer Responsibility System was introduced as a professional regulation specifically targeting the EPR principle.[58] It was the pioneering regulation that imposed producer responsibility for four categories of products: electrical appliances and electronics, vehicles, lead-acid batteries, as well as packaging. In 2021, the Ministry of Industry and Information Technology, along with several other ministries, issued the Pilot Implementation Plan for Extended Producer Responsibility for Automotive Products to promote the EPR principle within ELV recycling systems.[59] It is anticipated that the introduction and expansion of China's mandatory EPR program in the vehicle industry will encourage manufacturers to design products that optimise resource recovery at the end of use, thereby reducing waste generation and disposal.

Traditionally, manufacturers bear responsibility for ensuring the quality and safety of their automotive products. EPR requires manufacturers to adopt eco-design principles, implement clean production methods, and take responsibility for the collection, recycling, or disposal of their products at the end of life. In China, EPR encompasses a variety of policies, including mandatory information disclosure, green product subsidies, and product standards. For instance, under the EPR framework, the Law on Prevention and Control of Environmental Pollution mandates that producers of vehicle power batteries establish waste product recycling systems proportional to their sales volume and publicly disclose relevant information to ensure effective recycling and utilisation.[60]

Despite this policy momentum, current ELV legislation in China does not provide detailed rules for manufacturers and importers. The Measures Administration and Detailed Rules constitute the primary administrative instruments governing the ELV recycling industry. However, these regulatory measures primarily focus on government supervision of dismantling and disposal enterprises, without specifying the obligations of vehicle producers and importers in relation to ELV management.

The sociotechnical environment is unlikely to be altered by individuals acting alone. It is shaped by a broader framework that integrates new business models, technological innovations, and institutional regimes. Within this context, EPR is a beneficial component of a comprehensive strategy aimed at achieving sustainable production and

[58] SC, 生产者责任延伸制度推行方案 (Implementation Plan for the Extended Producer Responsibility System); issued in 2017 <https://www.gov.cn/zhengce/content/2017-01/03/content_5156043.htm> accessed in March 2024.

[59] Ministry of Industry and Information Technology, 汽车产品生产者责任延伸试点实施方案 (Pilot Implementation Plan for Extended Producer Responsibility for Automotive Products); issued in 2021 <https://www.gov.cn/zhengce/zhengceku/2021-06/10/content_5616601.htm> accessed in March 2024.

[60] NPCSC, 中华人民共和国固体废物污染环境防治法 (Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Wastes) Art 66; effective in 1996; last amended in 2020.

consumption patterns.[61] Nevertheless, in the ELV sector, China's current EPR system remains underdeveloped and ineffective. There is no incentive for design changes or actions by the manufacturers. The goal of all the administrative elements has been to prioritise process simplicity, which makes sense as it expedites the application of the law rather than engaging in protracted debate and conflict.

Furthermore, the actual responsibility of producers during the recycling stage of vehicles is not enough. In theory, producer responsibility encompasses two dimensions: operational responsibility and financial responsibility. Operational responsibility requires manufacturers and importers to establish collection and recycling systems, such as take-back networks and authorised disposal channels. Financial responsibility, while more flexible and typically coordinated by government authorities, involves manufacturers covering the costs of recycling and processing, often through payments to independent third-party operators.

3. PROBLEM DEFINITION AND RECOMMENDATION

3.1 Fragmented and Incoherent Legal Framework for ELV Laws

CE law and related legislation are rarely applied in judicial proceedings. The legal framework of CE in China consists of core law, specialised law and supporting regulations. As the current statute, the CE Law primarily focuses on promoting the development of a circular economy, but lacks enforceable provisions, resulting in limited legal operability.

In practice, CE-related laws are frequently overlooked, with no cases directly referencing them. Many judges and legal practitioners remain unaware of the CE law's existence, and its integration into judicial reasoning remains extremely limited. A key reason is the law's general provisions, which hinder practical application. For instance, Articles 51-56 of the CE Law address judicial responsibilities but fail to define essential terms such as 'CE behaviour', thereby complicating any legal proceedings based on the statute. Moreover, poor coordination among CE-related legal instruments has led to overlaps, duplication, and contradictions. For example, provisions on EPR appear in both the Solid Waste Law and the CE Law, yet they differ in scope, legal effect, and institutional design.

In conclusion, the current CE legal framework falls short of meeting the demands of contemporary economic development for a comprehensive resource recycling system.[62] Public and business engagement in such a system is severely constrained by unclear institutional responsibilities, weak enforcement capacity, and the lack of diversified enforcement mechanisms. Furthermore, the absence of an independent public interest litigation mechanism improves resource recycling and CE development, thereby limiting

[61] Xin Tong and Lin Yan, 'From Legal Transplants to Sustainable Transition: Extended Producer Responsibility in Chinese Waste Electrical and Electronic Equipment Management' (2013) 17(2) Journal of Industrial Ecology 199.

[62] Yupeng Fan and Chuanglin Fang, 'Circular Economy Development in China-Current Situation, Evaluation and Policy Implications' (2020) 84 Environmental impact assessment review 106441.

the effectiveness of CE policies in certain industries and regions.

The ELV industry in China faces similar Challenges. While a variety of regulatory instruments govern ELV recycling, they lack an integrated coordination mechanism. The ELV recycling system involves a wide range of stakeholders, including disposal companies, vehicle manufacturers and parts remanufacturers, resulting in a complex and fragmented regulatory landscape. The administrative governance of ELV recycling and processing adopts a model that combines both hierarchical and departmental management. The Ministry of Industry and Information Technology oversees market access, industry management, and formulation of various policies and plans for the vehicle and related industries. Meanwhile, the National Development and Reform Commission is responsible for the overall promotion and strategic management of the ELV parts remanufacturing industry. Daily supervision and qualification assessments of ELV recycling and dismantling enterprises fall under the jurisdiction of the Ministry of Commerce.

Additionally, ELV recycling and processing involves issues beyond resource recovery, including the recycling of renewable resources, environmental pollution control, and national public transportation safety. Therefore, agencies responsible for environmental protection, public security, and other public interests also assume supervisory roles in ELV management. However, it is not enough to consider only the post-disposal recycling of resources; the core issue encompasses the whole process, from pre-disposal to post-disposal stages.

These departments have different management methods for ELV at different product life cycle stages, and there is a lack of coordination. This has resulted in fragmented regulation and even conflicting management measures between different departments. A notable example is the regulatory inconsistency between the National Development and Reform Commission and the Ministry of Commerce regarding the treatment of the Five Main Assemblies of vehicles (engine, gearbox, front and rear axles and chassis frame). Before 2019, the Ministry of Commerce prohibited these core components from re-entering the market as remanufactured parts, while the NDRC's policy framework explicitly identified them as priority targets for remanufacturing. This regulatory mismatch prevented collaboration between dismantling and remanufacturing enterprises, significantly restricting the supply of raw materials necessary for remanufacturing. Consequently, the growth of the parts remanufacturing sector has been impeded by the restricted availability of raw materials for remanufacturing ELV parts. This calls for improved legislative coordination, with new or revised legal instruments aimed at aligning departmental mandates and removing systemic barriers to ELV remanufacturing.

The final issue concerns the blurred distinction between law and policy, which further contributes to the complexity of ELV governance. To date, many provisions in the Measures Administration and Detailed Rules serve primarily as general principles or non-binding guidance, lacking strong legal enforceability. As a result, policy documents are frequently used in practice to regulate specific procedures. In the long run, policy changes may not ensure stability regarding the rights and obligations of vehicle manufacturers and may even undermine the authority of the law, despite the benefits of allowing for flexible and quicker promotion of the number of ELV recycling, such as subsidies.

3.2 Incomplete Regulation of ELV Recycling Operations

Another issue with the ELV legal framework is its emphasis on enterprise qualification certificates, with less focus on the daily operation and management of the companies. As previously noted, the Measures Administration and Detailed Rules regulated enterprise qualification certificates for ELV disposal companies. In addition to obtaining qualification certificates from the Ministry of Commerce, ELV disposal companies must also secure licenses and business permits from the Public Security Department and the Industrial and Commercial Administration Department.[63]

There are stringent regulations regarding the registered capital of enterprises, dismantling sites, employees, and environmental protection measures. The authority to approve the establishment of ELV recycling enterprises rests with the provincial departments of commerce and must be reported to the Ministry of Commerce for record filing. However, compared to the establishment of ELV disposal companies, the government has not adequately addressed the operational management of these companies, such as environmental compliance checks, safety protocols, or the actual dismantling processes.

Historically, in pursuit of economic gain, some formally certified ELV disposal enterprises have engaged in irregular practices, including manipulating the reported number of scrapped vehicles and illicitly selling reusable parts from vehicles in good condition. In 2021, several local administrative authorities investigated the operations of the ELV disposal industry, for instance, in Changsha[64] and Hubei.[65] These investigations revealed that formally approved ELV recycling companies encountered problems such as illegal dismantling of ELVs and illegal transactions.

[63] Ministry of Commerce and others, 报废机动车回收管理办法细则 (Detailed Rules for Implementing End-of-Life Vehicle (ELV) Collection Management Measures), Chapter 2.

[64] During a law enforcement inspection of a material company, the Xianglong Administrative Law Enforcement Team of the Changsha County Administrative Law Enforcement Bureau (Hunan Province) found that an ELV recycling company in Tongren City (Guizhou Province) had auctioned a batch of scrapped motor vehicles from the material company half a month ago, including 108 tankers and mixer trucks. The ELV recycling company in Tongren City has the qualifications to dismantle scrapped motor vehicles, but the dismantling business site for which the qualifications were approved is in Tongren City, which does not comply with the relevant regulations for scrapped car dismantling. The scrapped car recycling company has been filed for investigation. Available at <http://www.csx.gov.cn/zwgk/zfxxgkml/gzdt75/bmdt/202112/t20211206_10379213_ext.html> accessed in March 2024.

[65] 检察机关服务保障碳达峰碳中和典型案例 (Typical Cases of Procuratorial Service Guaranteeing Carbon Peak and Carbon Neutrality); issued in June 2023 <https://www.spp.gov.cn/spp/xwfbh/wsfbh/202306/t20230605_616289.shtml> accessed in December 2024. The Hanjiang Branch of the Hubei Provincial Procuratorate learned that some ELV recycling companies or operators in Changlaokou Town, Xiantao City, dismantled and piled up scrapped motor vehicles on both sides of the road. Subsequently, the Hanjiang Branch found that 124 scrapped motor vehicle recycling operators did not have compliant dismantling sites and equipment and had serious disorderly development and illegal operations.

3.3 Unbalanced Distribution of Economic Benefits

In China, a significant number of ELVs are diverted into the black market instead of being transferred to formal dismantling facilities or legitimate second-hand markets. One key reason for this is the lack of enough economic incentives for ELV owners to deliver their vehicles to formal recycling channels. As the final holder of the vehicle, the owner plays an important role in the recycling and disposal stage. The ratio between the actual annual recycling number of ELVs and the total number of vehicles serves as a basic indicator of the operation level of a country's scrapped vehicle recycling network. As previously discussed, most ELVs in China do not enter the country's formal recycling channels for dismantling after being scrapped.

A primary factor behind this phenomenon is the underdeveloped incentive structure supporting vehicle owners' participation in formal recycling. Currently, vehicle owners have limited motivation to return their ELVs through legal channels. The average financial return for an ELV submitted through a certified disposal company is approximately 2,000 yuan. Compared to the purchase price of a new vehicle, the recycling price offered by formal ELV disposal companies is difficult for ELV owners.

Meanwhile, many unauthorised dismantling companies continue to operate in China. Motivated by high profit margins, these illegal actors routinely violate regulations by dismantling vehicle parts and assembling them into illicit vehicles for resale. By repairing the second-hand market rather than disassembling and shredding for material recovery, informal recyclers can increase their earnings and reduce transaction costs through their network of waste purchasers. By disregarding the environmental externalities of their practices, informal channels appear more efficient in economic terms. Consequently, the recycling fees paid by illegal companies to ELV owners are much higher than those offered by formal ELV disposal companies. The combination of financial incentives and minimal legal accountability drives many ELV owners to sell their vehicles to unauthorised operators, further limiting the formal recycling system.

To promote formal ELV recycling, the government provides targeted subsidies to vehicle owners. In general, these subsidies have played a crucial role in encouraging owners to dispose of their vehicles through officially designated channels. However, an analysis of recent subsidy disbursements reveals several issues that need to be addressed. First, the eligibility criteria for receiving subsidies are overly restrictive. In many cases, individuals are required to scrap their used vehicles and purchase new ones simultaneously to qualify. This condition excludes a large proportion of ELV owners, significantly limiting the reach of the subsidy program. Second, the range of ELV models targeted by subsidies is too narrow. In particular, the most common type, privately owned small passenger vehicles, is often excluded from eligibility. Third, the application procedures for these subsidies are complicated. National and local governments have made limited efforts to publicise the existence of the subsidy program, leaving many vehicle owners unaware of either the policy or the steps required to apply.

Finally, there is a notable lack of economic incentives for formal ELV disposal companies. As previously mentioned, most such companies in China are small in scale and operate under government guidance. Their primary sources of revenue are the resale of reusable parts and the sale of

dismantled metal materials. However, the absence of sufficient tax incentives and policy subsidies has led to excessive operational costs. This makes it difficult for these companies to offer competitive recycling fees to ELV owners. In contrast, illegal companies dismantle, assemble, and sell ELVs without complying with national regulations, resulting in higher profits. These black-market operators enjoy higher profit margins, as they are not subject to the 17 percent value-added tax or other formal disposal costs required of legal enterprises. As a result, formal recyclers face significant disadvantages in market competition. Moreover, the supply of ELVs to formal channels is inconsistent. Most vehicles entering the formal system originate from accidents and are dismantled only during specific periods of the year.

In conclusion, the government should establish an effective economic incentive mechanism to provide policy support for both ELV owners and recycling companies. In addition, given the growing number of vehicles being sold across regions and internationally, the potential impact of foreign policy frameworks on domestic recycling strategies should be carefully considered.

4. CONCLUSION

The Chinese government plays a leading role in developing the ELV industry, primarily through laws and policies. In China, the development of the ELV industry has been largely policy-driven, with the government playing a central role through a combination of legal and administrative measures. Over the past two decades, various laws and policies have gradually extended their focus from pollution control to resource recovery and, more recently, toward promoting CE principles. These legal and policy frameworks exhibit several distinct characteristics. At the producer stage, only some legislation sets information rules for manufacturers without specifically articulating a concrete EPR scheme. There are no practical provisions to make EPR effective for vehicle manufacturers. During the use stage, consumer responsibility is incorporated into earlier ELV policies through subsidy strategies. At the ELV disposal stage, with funding mechanisms not proposed, standards for ELV recycling and disposal are established. The administration and supervision systems are strong, particularly at the ELV disposal stages. Overall, although China has issued specific legislation for a long time, it lacks a specific mechanism to solve ELV problems.

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