



# Why does the informal sector of end-of-life vehicle treatment thrive? A case study of China and lessons for developing countries in motorization process



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## ABSTRACT

Illegal end-of-life vehicle (ELV) treatment is a significant barrier to sound ELV management. The main issues concerning illegal ELV treatment in heavily motorized countries are random dumping of automobile shredder residue (ASR), and random abandoning of ELVs. Different from heavily motorized countries, a notable problem in China is that a large number of ELVs are flowing into the informal sector every year. This number seems to grow with the constant and tremendous rise of vehicle usage in China. The goal of this paper is to better understand this problem, and provide a document for references in the establishment of a high quality ELV management system in the motorization process. This paper combined desk research and field work in China to explore the underlying factors behind the problem, and the lessons which developing countries in the motorization process could learn from China. We found that the persistent existence of an extensive informal ELV treatment sector in China is due to a combination of economic, social, historical and administrative factors. It is unlikely that any of these factors on their own would prolong the existence of the informal ELV sector. However, it is difficult or nearly impossible to make a qualitative change to the economic, social and historical factors that prolong the existence of the informal ELV sector. On the other hand, administrative factors are comparatively easy to change. We thus provide recommendations about ELV management for developing countries in the motorization process, based on the analysis of administrative factors.

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## 1. Introduction

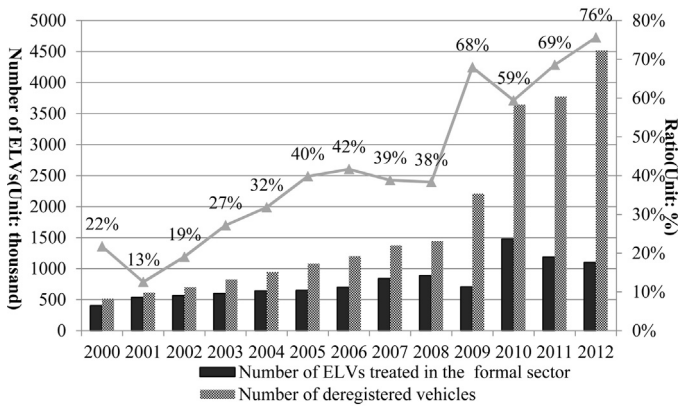
Motor vehicles are hi-tech products composed of tens of thousands of parts, which not only include different recyclable materials such as steel, copper, rubber, etc., but also contain various toxic substances like lubricants, acid solutions, and coolants. Hence, sound ELV management is critical to environmental protection as well as resource conservation.

Illegal ELV treatment is a significant barrier to sound ELV management. Random dumping of ASR and randomly abandoning ELVs are the main issues concerning illegal ELV treatment in motorized countries such as the EU (Togawa, 2001; Smith et al., 2004; Mazzanti and Zoboli, 2006; Smink, 2007; Kumar and Putnam, 2008), New Zealand (Cassells et al., 2005) and Japan (Hiratsuka et al., 2013). Differing from these heavily motorized countries, China, a developing country in the motorization process, has a large

number of ELVs flowing into the informal sector (Wang and Obata, 2009; Hiraiwa, 2011; Wang and Chen, 2012; Hu and Kurasaka, 2013).

The purpose of this paper is to better understand the distinctive problem of ELVs flowing into the informal sector in China and provide references for ELV management in the motorization process. As access to the informal ELV treatment sector is much more limited than to the formal sector, we used a combined method of desk research and field work to gather as much related information as possible. Through desk research, we collected relevant research articles, yearbooks, government documents and news reports from important Chinese newspapers in public circulation from January 2000 to September 2012. The field work was conducted in Hunan province, Chongqing municipality and Guangzhou province in May–June, 2012, including field observations and interviews with relevant stakeholders. First, we describe the status quo of the informal ELV treatment sector in China including its scale, the main actors and the types of informal ELV recycling business. We then proceed to examine the financial drivers of the informal sector of ELV treatment in detail. Next, we conduct an in-depth

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**Fig. 1.** Annual number of ELVs treated in the formal sector, deregistered vehicles and ratio of ELVs passing into the informal sector in China 2000–2012.  
Data source: China National Resources Recycling Association.

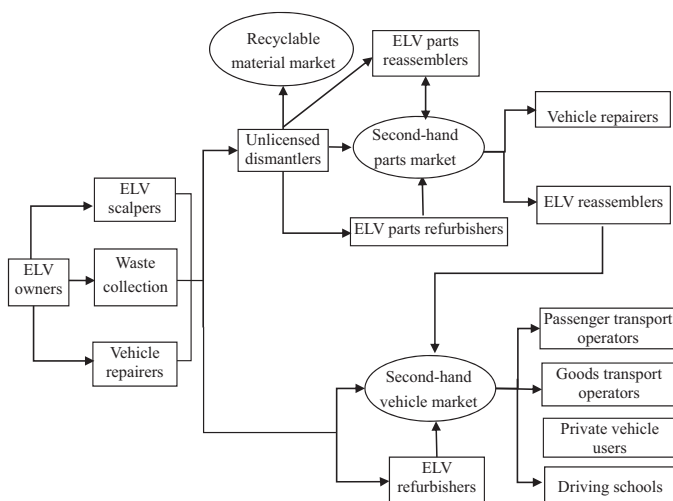
analysis of the underlying factors behind the problem. We also identify the dilemmas which China faces in ELV management. Finally, we explore the lessons which can be learned from China based on the analysis of the administrative factors.

We expect that the qualitative analysis of the factors that contribute to the problem will offer a basis for the quantitative model which simulates the future trend of ELVs passing into the informal sector in China. The analysis is also expected to provide a reference for research on the informal ELV treatment sectors or other waste treatment in different countries. The results are intended to help developing countries build a high quality ELV management system.

## 2. Status quo of the informal ELV treatment sector in China

As shown in Fig. 1, the number of deregistered vehicles increased from 2000 to 2012, but the number of ELVs treated in the formal sector did not increase at the same rate. In contrast, there is an upward trend for the ratio of ELVs passing into the informal sector.

The rectangular boxes in Fig. 2 show the main actors participating in the informal ELV treatment sector in China. In many cases, an actor shown in one sector plays multiple roles. For example, a



**Fig. 2.** The main actors in the informal sector of ELV treatment in China.  
Source: Authors' elaboration based on the China Auto Market Almanac 2011 and field investigations in Hunan province, Chongqing municipality and Guangzhou province in China, May–June 2012.

**Table 1**  
Six types of informal ELV recycling business in China.

	Reusing	Refurbishing	Reassembling
ELV part	<b>A:</b> Directly selling the parts (including five functional assemblies) dismantled from ELVs (sometimes after cleaning them roughly)	<b>B:</b> Selling the parts (mainly five functional assemblies) after repairing heavy damage, processing sheet metal, polishing and painting	<b>C:</b> Using the parts dismantled from different ELVs to reassemble the five functional assemblies which can be sold as secondhand goods
ELV	<b>D:</b> Directly selling the ELVs as secondhand vehicles	<b>E:</b> Selling the ELVs after replacing parts with obvious problems, processing sheet metal, polishing and painting them	<b>F:</b> Using the ELV body, five functional assemblies or other parts of ELVs and any other available low-price parts to reassemble a vehicle which can be sold as a secondhand vehicle

Source: Authors' elaboration based on our field observations and face-to-face interviews with unlicensed recyclers in Hunan province, Chongqing and Guangzhou province in May–June 2012 and Hiraawa (2011).

waste collection center is also an unlicensed dismantler. A vehicle repairer is sometimes an unlicensed dismantler and an ELV refurbisher. An ELV refurbisher may also be an unlicensed dismantler, etc.

Table 1 shows the types of business which the informal recyclers mainly benefit from. The China Auto Market Almanac 2011 shows that in 2010 approximately 50% of ELVs in the informal sector were dismantled for selling their parts and approximately 50% of ELVs in the informal sector were processed for selling second-hand vehicles. As shown in Table 1, the majority of ELV parts sales in the informal sector consist of reused/refurbished/reassembled “five functional assemblies (a general term for the engine, front and back bridges, accelerator pedal, direction gear and chassis)” which are legally required to be cut into pieces and sold only as recyclable materials. ELVs in China include vehicles meeting the national compulsory scrapping standards which requires vehicles (except private cars) to be scrapped when their service period or mileage reaches the prescribed standard. A significant number of such ELVs are processed by the informal recyclers and sold as second-hand vehicles in China every year. Accordingly, the sales of reused/refurbished/reassembled ELVs are a major source of informal recyclers' revenue.

Moving from left to right in complexity, rows show the increased use of advanced technology as the recycling process becomes more complex. As we move down the columns, the raw material used becomes increasingly complex. To summarize, the more complex the operation, and the more specialized the equipment, the higher the skill level needed to complete processes A, B, C, D, E and F. Similarly, there is more value added and the recycling costs increase when moving up the scale, from A to F.

It is worth noting that vehicle repairers play a special role in the informal ELV treatment sector in China. The vehicle repairer is not only a buyer of ELVs but also a consumer of ELV parts. They are also a significant force in recycling ELVs. Vehicle repairers that work in the informal sector usually dismantle ELVs and refurbish ELV parts or whole ELVs and even reassemble ELVs. In the vehicle maintenance process, vehicle repairers have accumulated a lot of knowledge about how to judge the conditions of vehicles and the damage of vehicle parts. They also possess a set of vehicle maintenance skills such as painting, polishing, processing sheet metal, and welding. These skills can also be used

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