



The Story of a Dying Car in India

*Understanding the Economic and Materials
Flow of End-of-Life vehicles*

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New Delhi, June 2012

About Chintan Environmental Research and Action Group

Chintan is a registered non-profit organization with a vision of inclusive, sustainable, and equitable growth for all. Our mission is to reduce ecological footprints and increase environmental justice through systemic change brought about through partnerships, capacity building at the grassroots, advocacy and research, and sustainable, scalable models on the ground.

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The services delivered by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH draws on a wealth of regional and technical expertise and tried and tested management know-how. As a federal enterprise, we support the German government in achieving its objectives in the field of international cooperation for sustainable development. The Indo-German Environment Partnership (IGEP) is a joint programme of the Ministry of Environment and Forests (MoEF) Government of India and the German International Cooperation (GIZ) on behalf of the Federal Ministry for Economic Cooperation and Development, Germany, focusing on urban and industrial environmental management in India.

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Executive Summary

This report summarises the results of two surveys and a number of field-based research missions carried out in the End-of-Life Vehicles (ELV) industry in Northern India. The research aims to present a clear picture of what happens to a vehicle in India at the end of its life-cycle. As a first step, a schematic materials flow has been developed through a participatory process with users, dismantlers, and recyclers. The study shows that the ELV industry consists of many different participants, who constantly interact with each other in a complex, interdependent process. The study provides a better understanding of the economics of the recycling of ELVs in India, as well as an insight into the attitudes, knowledge, and practices of the ELV handlers. The major focus of the study is the economic, environmental, and social challenges that emanate from a change in status quo. For the environmental issues, the report identifies a number of different individual vehicle parts as either waste (i.e., cannot be reused or recycled) or posing environmental danger (i.e., toxic to either humans or wildlife), according to the way they are currently treated by the informal sector. The report ends by presenting a series of recommendations on how to improve the resource efficiency of the ELV industry in India. It proposes a system to recognise and formalise the work of a currently largely informal sector, and ways for vehicle manufacturers to take responsibility for the products they release in the market.



Introduction

This study is based on the need to enhance resource efficiency, and thus tap valuable gains, in the End-of-Life Vehicle (ELV) industry in India. End-of-life vehicles contain many materials and parts that can be refurbished and reused, thereby producing an important opportunity for clear gains in resource efficiency. A wide range of materials, from valuable metals to low grade used oils, are available from an end-of-life vehicle. Understanding the flow of these materials is critical to improving their efficient use. In the EU, which has been collecting data on ELVs for a relatively long period of time, more than 85 per cent of a vehicle's weight is recovered, recycled or reused, according to Eurostat data.

Currently in India, the management of ELVs is essentially left to an informal and unregulated sector. It does, however, interact with the formal sector, especially in the field of scrap metal and other high-value, low-toxicity materials. The materials that stay within the informal sector through their recovery life-cycle tend to be of the lowest value and most highly toxic, due to the lack of interest for these materials from the formal sector. Although the informal sector is often seen as highly efficient in resource recovery, it is also known for its lack of record-keeping and, therefore, its inability to monitor and display performance and get credit for its work. Also, given the nature of their practices, the informal sector is not always environmentally benign, especially with regard to material recovery.

This study aims to provide a much-needed insight into the current system of ELV processing. Results from a series of surveys of both vehicle disposers and ELV traders and processors identify the main participants in the industry and the most prevalent ways in which they interact with each other. Understanding these interactions is essential to forming a basis of intervention policies that will affect the efficiency and sustainability of the sector. The trader survey provides data to map the flow of material between different participants within the industry. The main priority of the survey is to understand how and where hazardous materials are traded and under what conditions

they are treated. Second to hazardous and toxic materials, the next priority is to identify components for which there is no potential reuse. Parts that do not currently have a market, for example, or that cannot be extracted from the ELV without damage, due to possible technical limitations, need to be identified. This data will provide evidence that can be used to prioritise intervention strategies within the industry.

The end-user survey provides an understanding of the decision-making and planning in vehicle disposal, and how the vehicle can then enter the ELV dismantling industry. The survey also provides insights into consumer awareness of the social and environmental issues involved in ELV disposal. Understanding the correlation between stated desires (e.g., environmental concerns, best value for money, etc.) and actual disposal methods will provide data on whether greater information dissemination is required to marry people's intended outcomes with the actual disposal of the vehicle.

The Indian vehicle industry is growing exponentially every year. More importantly, this growth trend began nearly twenty years ago, suggesting that the demand for ELV treatment will start to show a similar trend in the next few years. It is essential, therefore, to understand this industry, in order to ensure that policy makers have adequate evidence to base the crucial decisions they will need to make, for efficient and sustainable economic growth in the future.

Some companies doing business in India, particularly in the electronics sector, have begun to adhere to the concept of Extended Producer Responsibility (EPR) as a result of legislation, whereby the initial manufacturer of a product is responsible for the proper disposal of their product at the end of its usable life. This spirit is also behind the initiative of the Ministry of Heavy Industries and Public Enterprises initiative of creating an ELV recycling centre in Chennai under the auspices of the National Automotive Testing and R&D Infrastructure Project (NATRIP). This public initiative is set up in direct cooperation with, and strong involvement of, the Society of Indian Automobile Manufacturers (SIAM), which supported while drawing up specifications and layouts for the various components of the unit. However, the legal support for such an initiative in the ELV sector is still missing.

In the ELV industry, the disposal challenge is compounded by the high value embodied in a lot of the "waste" created by an ELV. Large companies are, therefore, attempting to become involved in recuperating valuable material from their own products. They are interested in developing the reverse logistics based on experiences in other countries around the world.

The Indian economy has been on a steady growth path since the late 1980s. According to World Bank data, the average GDP increased more than 6.2 percent from 1980 to 2011¹. The growth of the economy has fuelled a huge drive in urbanisation. The combination of

1 World Bank DataBank, accessed on 07-12-2012, analysed in house.

higher incomes and changing lifestyles have affected consumer choices and resulted in an exponential increase in the purchase and ownership of motorised vehicles, as seen in Figure 1 below.

Vehicle population has grown at a spectacular rate of 9% since economic liberalization in 1991.

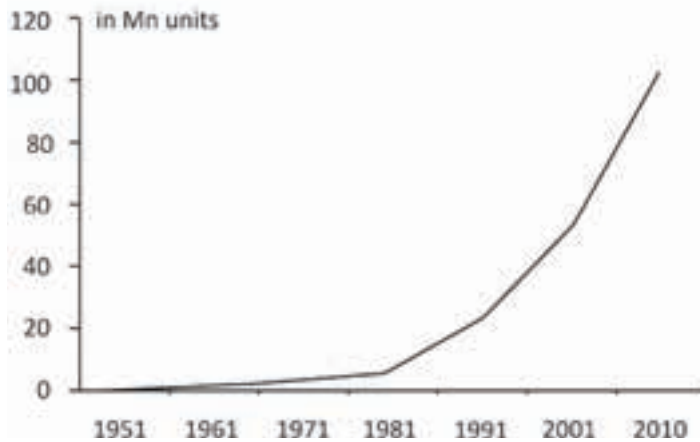


Figure 1: Vehicle Ownership in India.

Source: Indian Automotive Aftermarket Study book 2011

The majority of these vehicles are two-wheelers, as shown in Figure 2 below.

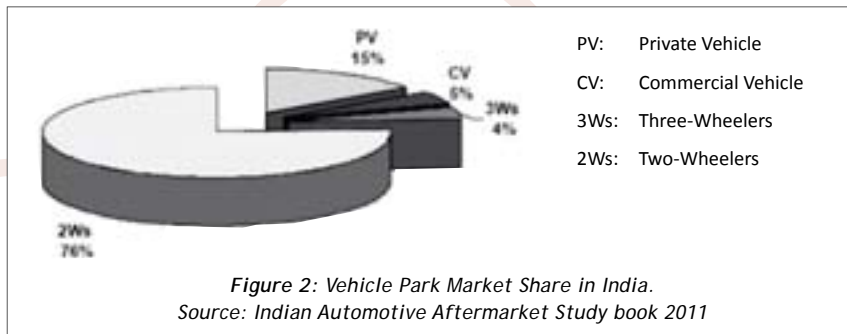


Figure 2: Vehicle Park Market Share in India.

Source: Indian Automotive Aftermarket Study book 2011

The Current ELV Market Reminiscent of the Solid Waste Market

The management of municipal solid waste, known to most of us as “rubbish”, “garbage” or “trash”, has changed drastically in the past 20 years. Several comparisons can be made between the ELV industry of today and that of the municipal waste industry 20 years ago. Just like ELVs today, municipal waste management used to be dominated

by an unregulated informal sector, uncontrolled by any central policy to monitor their behaviour. Over time, the private sector has become involved in waste management, drawn by its increased profit margins and legislative changes. In some areas the transition has been positive for the environment and society in general. In most cases, however, this transition has not been effectively managed, resulting in a loss of inherent efficiency in the informal sector. Avoiding mistakes made in such situations will ensure a smooth transition to a more formal and better regulated ELV sector.

By drawing on these parallels, it will be possible to frame an efficient strategy to move from an unregulated ELV disposal system to a regulated, clean, and socially inclusive system. Further, some of the mistakes made in the Solid Waste Management sector, such as unnecessarily favouring large corporations with little experience over small dealers with specialised, first-hand knowledge and expertise, can be avoided.

Aims and Objectives of this Study

This study aims to take a snapshot of the current ELV dismantling sector in North India, to assist policy makers with empirical data for their regulatory decision-making. The study will focus on the people and materials involved in the dismantling and recycling of an ELV. A process map will outline the interactions of the different participants. This will provide policy makers with the data needed to understand those who are affected by their decisions. Secondly, the study will compile a list of toxic materials that are currently not being dealt with appropriately. This will highlight the areas of the ELV industry that require immediate attention and action, because of the adverse effects that current procedures pose to human health and the environment. Lastly, a “Knowledge, Attitude and Practices” (KAP) survey of actual car users and disposers will show how final users make their vehicle disposal decision and in what manner they get rid of their cars. This will allow an understanding of the extent to which final disposers need to be involved and/or the incentives that need to be provided in any policies relating to the ELV sector. The study will then conclude with a set of recommendations for new policies, and areas of action for policy makers which would improve resource recovery and overall sustainability of the ELV sector.

Methodology

Information for this study was gathered through both qualitative and quantitative data collection methods. This methodology was based on the need to document an industry which has been operating with little or no records for many years.

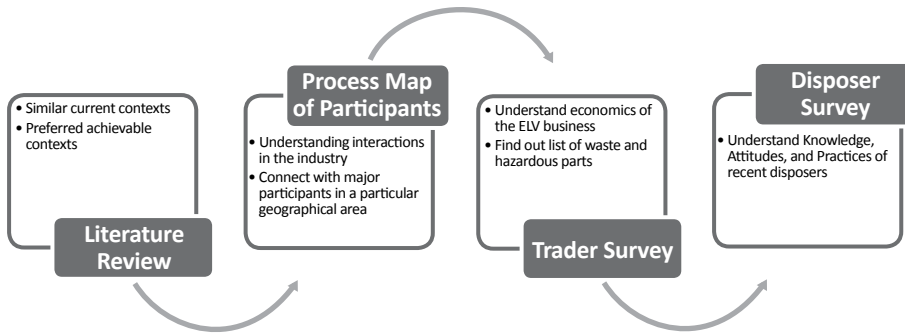
The literature survey presents a broader picture of the industry. It highlights other parts of the world where the situation may be very similar to the current Indian context, or could be made similar in certain ways after the implementation of recommended policies.

The literature review was followed by a number of open-ended discussions in the field. These discussions gave the research team a basic understanding of the various participants, their specialisations, locations, and their interactions with each other, thereby creating the work-flow process map of the industry.

These two techniques, outlined above, make up the qualitative section of the study. Together, they provide the quantitative aspects, described below, to be executed.

A trader survey was conducted by interviewing a sample of those identified during the informal interactions in putting together the process map. This allowed the team to understand exactly which parts of the vehicle a specific participant would work on. A list of priority materials to be addressed in order of their toxicity could then be created. A database of most recent disposers was also created as a result of the trader surveys.

The recent disposers were then interviewed to better understand their knowledge, attitude, and practices with regard to disposing of a vehicle.



Qualitative Field-Based Informal Discussions

Informal discussions were carried out in the field to gain a basic overview of the entire ELV dismantling process. These discussions laid the foundation for the study team to understand some basics of the work-flow process and, therefore, frame the questionnaires for subsequent surveys in a more effective manner. These investigations resulted in information-gathering about the processes involved in various material extraction procedures. The fact-finding team was experienced in recognising processes likely to produce toxic, hazardous outputs and by-products.

Chintan used its own linkages with the informal sector to uncover trading and dismantling links within the informal sector. However, most of the chain and the trade was understood by asking each trader about his contacts, business linkages, and a request for an introduction to such persons. This ‘mapping’ helped to follow a less known trade and the informal sector within it, as well as build credibility and a relationship in a short time. Using this research methodology, researchers were directed to Najibabad, for example, that was not part of the original plan (see Figure 3).

Quantitative Trader Survey

First, traders were separated into two distinct classes -- formal and informal traders. The distinction between the two groups was based on three criteria. If a trader possessed all three of the following prerequisites, they were considered “formal”:

- A mailing address
- A land line number
- A permanent housing structure

If any of the above was not available, the traders were considered “informal traders”. The following sections show that the data collected from these two data sets did not differ statistically. It has become obvious from field observations that this is due to the lack of a formal recycling system integrating all the materials involved. As a result

of the absence of such a system, participants who fit the criteria of formality interact with the informal sector that they operate in a near identical fashion. As part of the questionnaire, traders were asked to provide contact details to at least three people or organisations from whom they had recently bought an ELV. This list of contacts was then used as part of the survey subsequently described.

Quantitative Final User/Disposer Survey

The traders interviewed in the previous survey provided contact details for 510 recent disposers, including individual car owners and organisational fleet managers. They were interviewed and asked to answer the questionnaire. This questionnaire collected data on the respondent's profile, their reasons and means of disposing of their old vehicle, and on their attitude towards the disposal of their vehicle. In determining attitude, this study focuses on the concepts of value for money, knowledge of environmental burden, and acceptance of the formal sector's importance in the ELV industry.



The Methodology at Work

Identifying a dismantling platform

ELVs themselves, but to a greater extent, the parts extracted from them, are traded across regional boundaries. This seems to be due to the huge number and variety of parts that comprise an ELV -- some require a high level of specialisation and aggregation to extract their value. Particular “trading platforms” can, therefore, be identified and mapped out according to the general geographical area, across which the parts of one ELV are traded. These are, obviously, not clearly defined and overlap, but this study has tried to capture as much of the trade in one of these platforms by focusing its research on five major cities in Delhi and Uttar Pradesh. A snapshot of another platform was taken by conducting some research in Kolkata.

The survey was conducted in seven major cities of North India: Delhi, Manesar, Kolkata, and Lucknow, Meerut, Moradabad, and Nazibabad, in Western Uttar Pradesh. Interactive sessions using standardised questionnaires were used to interview the owners or

managers of dismantling, reprocessing, or repairing units in these areas. The areas in Delhi and Western Uttar Pradesh were chosen in order to capture all the data from one “dismantling platform”. Kolkata was chosen in order to get a snapshot of different ELV platforms, which require additional study.



Figure 3: Cities in which the ELV Survey was conducted

Delhi Survey Areas

The Delhi survey involved sampling in eight different areas (see Figure 4), with details on their size in Table 1

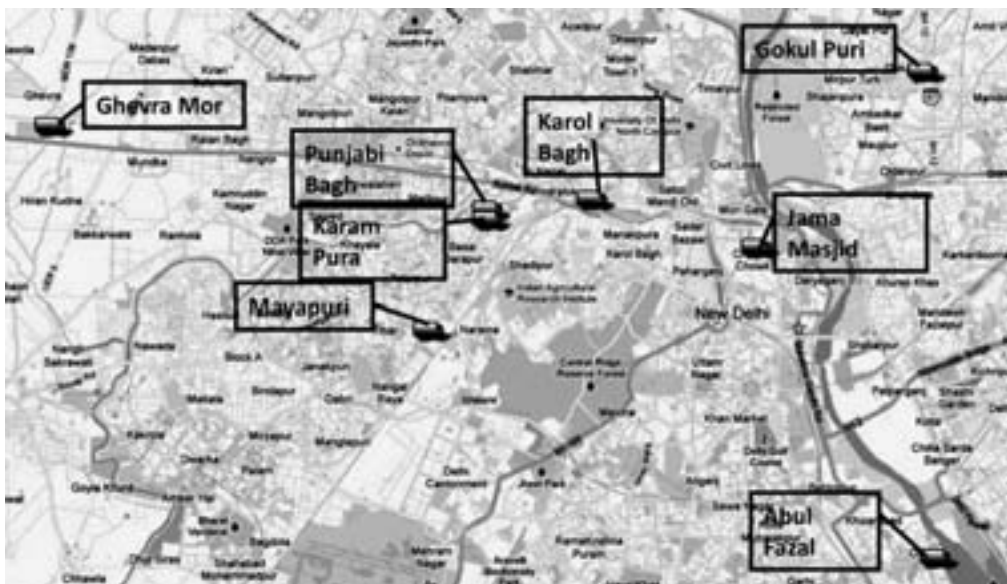


Figure 4: Delhi Survey Areas

Table 1 Survey Area Details

City	Survey Area	Number of Units Operating in the ELV Industry
Delhi	Mayapuri	3000
	Gokul Puri	90
	Jama Masjid	68
	Abul Fazal	6
	Punjabi Bagh	5
	Karam Pura	4
	Karol Bagh	3
	Gehvra Mor	2
Meerut	Chatriwala Peer	15
	Soti Ganj	55
Kolkata	Phool Bagan	1000
Nazibabad	Kabari Bazaar	150
Moradabad	Landgey ki Puliya	100
	Nawabpura	Only informal Discussions
	Karaula	Only informal Discussions
	Transport Nagar	Only informal Discussions

Source: Chintan fact-finding mission, part of a Delhi Pollution Control Board assignment, 2011.

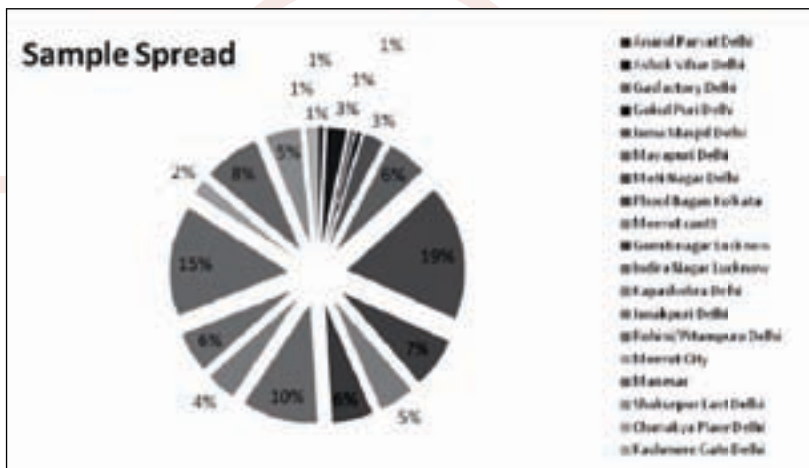


Figure 5: Trader survey samples: Geographical spread

The Current Landscape

The Automotive Recyclers Association published a report on End-of-Life Vehicles Worldwide in 2012, which clearly describes the industry². This report underscores many of the existing best practices and key challenges faced by the industry.

According to the report, more than 100,000 family units are involved in ELV dismantling in India, usually organised around informal centres specialised in particular tasks. These units were originally formed around the outskirts of major towns, but have now been integrated into highly densely populated areas as a result of the explosive expansion of urban cities in India. The informal sector performs a critical role in recovering valuable resources from ELVs and is surprisingly efficient in doing so. It, however, does not adhere to any particular environmental norms and is responsible for large amounts of toxic compound releases into the air, ground and water. Guidelines need to be issued and enforced alongside a strategy to ensure the sector remains efficient whilst incorporating all modern social and environmental legislation.

Best-Practices: Treatment of ELVs in Other Countries

European Union

The European Union (EU) was the first to initiate regulatory legislation on ELV recycling with the Directive 2000/53/EC of the European Parliament, on 18 September 2000. The Directive was designed to reduce the amount of landfill space required for ELV disposal, while ensuring a uniform treatment schedule across all member states. It also includes provisions to eliminate leakage of hazardous compounds from the treatment system, by introducing an EU-wide certificate of destruction (CoD), required for a vehicle owner to stop paying registration and road tax, if applicable in their member state.

2 Automotive Recyclers Association. 2012. End-of-Life Vehicles Worldwide. Retrieved on 7 December, 2012 from: <http://www.a-r-a.org/article.asp?paper=102&cat=166&article=804>

The directive includes major stakeholders, such as manufacturers, in the process. Manufacturers are required to provide dismantlers with specific dismantling information for their vehicles, particularly for hazardous parts.³

Japan

Japan also moved early with an ELV Recycling Law in 2002. It holds similar provisions to the EU Directive, but goes one step further in applying “the polluter pays” principle. Indeed, vehicle manufacturers and importers are tasked with creating reverse logistics systems for any parts and components that are not recyclable or reusable. These include Automobile Shredding Residue (ASR), airbags and chloro-fluorocarbons (CFCs). Manufacturers and importers are not simply in charge of collecting these materials but must also organise and fund their safe dismantling.

As a result of this regulation, the cost of recycling a vehicle is absorbed by the industry. This has pushed the industry to take disposal costs into account when designing and manufacturing new vehicles.⁴

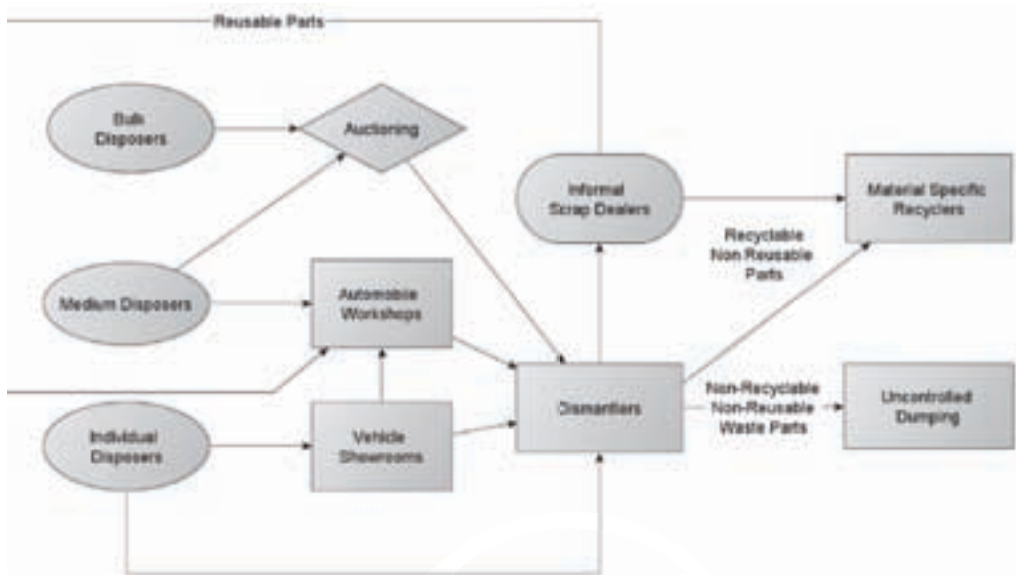


- 3 Official Journal of the European Communities. 2000. DIRECTIVE 2000/53/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL, 18 September 2000, on end-of life vehicles (OJ L 269 , 21.10.2000, p. 34)
- 4 US EPA. 2008. *Recycling and Reuse: End-of-Life Vehicles and Producer Responsibility*. Retrieved on 11 December, 2012, from: http://www.epa.gov/oswer/international/factsheets/200811_elv_directive.htm#ASIA

Sustainable Development Impacts of the Industry

We now outline the sustainable development impacts of the current processes of ELV recycling by outlining the social, environmental and economic aspects in turn.

Social Aspects



Note: Field surveys showed there was a distinction between certain disposers who would always sell all their ELVs at auction and others who would sometimes need to sell only one ELV to a workshop. The distinction was based on size, but it was not possible to put a number on it.

The figure above shows the interaction between the different participants in the disposal of End-of-Life Vehicles. It has been created based on information collected during the field research as described in the methodology chapter.

The process map shows a diverse interaction between participants within the industry. First, disposers can be categorised based on their disposal practice. Bulk disposers, such as government transport agencies operating large fleets, always sell at auction. Individual disposers, however, would only have access to vehicle showrooms where they would return their old vehicle in exchange for a discount on a new one, or to local dismantlers. Between these two types of disposers are the medium-size disposers who would sometimes have enough ELVs to bring to auction, but would, most often, have to turn to automobile workshops.

Whether it goes to auction, a workshop, or a showroom, an ELV always has to go through a dismantler, the cornerstone in this whole interaction. Dismantlers, then, redirect the different parts either to a scrap dealer for reuse, to recyclers, or simply dispose of the product in an uncontrolled and unregulated fashion.

Through the surveys, it has been possible to quantify the interaction described above. It is important to realise, however, that the entire process is highly dynamic and complex, and it responds to a number of different market signals and pressures. The whole system is highly efficient, and all the key participants have a strong ability to respond quickly to market changes.

Vehicle Sourcing

In the flowchart, the main participants surveyed, who provide valuable data, are marked “dismantlers”. The results show that they, like other parts of the flowchart, have a complex interaction schedule with other participants. Most individual dismantlers, for example, source their vehicles from more than one of the possible sources described in the chart. It seems, however, that the largest source of vehicles for these dismantlers is individual disposers who contact them directly. Indeed, 89 percent of dismantlers claimed that people come straight to them to dispose of their ELV. Forty-two percent claim they also buy vehicles by independently approaching mechanics, showrooms, and workshops. In addition, only 15 percent claim to go to vehicle auctions. Obviously, these percentages do not add up to 100, as respondents were encouraged to give more than one answer when applicable.

The data shows that most participants in the market, including disposers, are aware of the value of their ELVs and know where they can take them in order to extract their full value.

Dismantled Parts Use

The data shows that dismantlers seem to naturally follow some major parts of the waste hierarchy, whereby waste reduction is given priority over reuse, and reuse is given priority over recycling. When asked what the respondents did with a purchased vehicle, 39 per cent claimed they simply fix or replace various parts and resell it as a working vehicle. This segment of respondents says they source the parts they use in these refurbished vehicles from other ELVs which they dismantle themselves. This practice is possibly enhanced by the behaviour of disposers, as described in the following chapter on Perspectives, where a large percentage have decided to dispose of their vehicles simply through a consumer desire for a newer version, rather than any specific technical issue with the vehicle. Consumers are, therefore, buying two or more identical or similar vehicles, using parts from one to fix others, selling refurbished, operable vehicles, then recycling the unusable parts from each vehicle.

Another 22 percent of the respondents say they are able to sell damaged parts to specialised refurbishers. This practice allows for resources to be efficiently utilised, with very little waste being generated. Indeed, only 13 percent of respondents claim there were certain parts of a vehicle for which they could find no resale value.

The survey shed light on another interesting component of the geographical nature of the ELV dismantling and recycling demographic. Certain cities have specialised in the appropriate treatment and recycling of particular parts and materials. This is the case, for example, of all oil recycling in Meerut, whereas all the steel parts are sent to Muzaffar Nagar for further treatment. In fact, the only system closely resembling a closed loop system was discovered during the survey of the Uttar Pradesh Roadways system for government vehicles. This system was on enough of a large scale to incorporate all the elements of the recycling and treatment process, without having to resort to further treatment outside their area. All parts were bought, traded, and reused locally by local traders and mechanics. The large quantity of ELV waste from the UP Roadways allowed for a comprehensive ecosystem to exist in one area.

Box 1: Medium and Bulk Disposers: A Case Study in Moradabad

Three neighbourhoods were surveyed in this city: *Langdey ki Puliya*, *Darshimhal Ghat*, and *Karaula*. It quickly became apparent that the informal sector has a highly-strained relationship with the police in Moradabad, highlighted by a recent incident involving some stolen cars.

Overall, in the three areas, there is a clear distinction between large-scale dealers, organised into a more formal association, and small-scale dealers, who struggle to manage the bureaucratic process. The small dealers have to often struggle with proof of ownership of the cars they bought, regular police crackdowns, and the need to have greater organisational structures so they can develop and evolve into more recognised groups.

Langdey ki Pulliya is a center for dismantlers. The vehicles are procured in large part through auctions involving bulk dealers. Reusable parts are then be removed and sold directly to scrap dealers.

Non-reusable parts are sold on to small family units in *Darshimhal Ghat* and *Karaula*. Each of these units tends to specialise in the recycling or extraction of one particular part or unit. Many of these processes involve dangerously caustic materials and generally unhealthy working conditions.

Environmental Aspects

Each ELV is dismantled into thousands, even tens of thousands, of different individual parts, each with its own distinctive market and environmental burden. For the purposes of clarity and effectiveness, this study focuses on a selected number of ELV components based on considerations of their toxicity and waste. These components are broken down into simple categories, fluids on one side and solids on the other. Further to these toxic parts, the economics of non-toxic, more valuable parts was studied in order to understand the major source of revenue generation for dismantlers.

Fluids

The fluids used in the operation of a vehicle are inherently toxic and are, therefore, chosen as a subject of more detailed study in this report. From basic engine oil to brake fluids and hydraulic fluids, through AC gas and battery acid, there are a multitude of environmental hazards involved in the removal and recovery of these liquids. Table 2 presents the results of the fact-finding missions concerning the fate of these liquids.

Table 2: Fluid Parts of an ELV and their Disposal Method

Fluid	Disposal Method
Engine Oil	Drained or sold to the vendors. Oils are sold at Rs. 25/L. The collected oils are either sold to furnaces or small informal refineries. The vendors sell them on to informal refinery units. The refined oil is either packed and resold into the market, or sold loose and adulterated. The unrefined oil is sold for application on cog wheels in machines, such as crushers or bucket wheels, for lubricating crane wires, and also burned in furnaces or boiler for generation of heat.
Transmission	All of these oils are mixed together and “refined” by heating. They are then mixed with a viscosity amending chemical which allows the solidified mix to be used for the lubrication of cogs. There are some traders who do not have the necessary scale to produce this lubricant themselves so sell it on, or alternatively, in rare cases, drain it to the ground.
Coolant Fluid	
Power Steering Fluid	
Brake Fluid	
Hydraulic Fluid	
Gear Oil	
Battery Acid	Drained
A.C. -Gas	Released into the air

These are toxic and require careful handling, and can cause soil and groundwater contamination if improperly disposed⁵

5 <http://www.nrdc.org/water/pollution/gsteps.asp>

Solids

As stated above, an ELV can be dismantled into an almost endless list of individual parts. The selection in **Table 3** is chosen based on the hazardous nature of the embedded chemical components or the process involved in their extraction.

Table 3: Solid parts of an ELV containing hazardous compounds and their disposal and recycling methods

Solid Part	Disposal and Recycling Method
Air Filter	If the air filter cannot be reused directly, the ferrous parts are sold to kabaris for Rs. 15 - 18 per Kg and the foams are burned or dumped. Key Toxicity: Foams are made up of polyurethane which release potentially hazardous dioxins when burned.
Oil Filter	Non-working oil filters are sold to scrap dealers. First, paper from the filter is removed - dumped or burned. Metallic parts are sold to kabaris for Rs. 15-22 per Kg, which is then sent to the recyclers for Rs. 25 per Kg. Key Toxicity: Residue oil and toxic particles released to ground and air from dumping and burning the filter paper.
Brake Shoe	Brake shoes often contain a asbestos traces, sometimes equivalent to 20 percent of the weight of the shoe. The asbestos is removed and dumped, while the metallic part is sold to kabaris, which is then sent for recycling. Scrap dealers sell these metal brake parts to recyclers. The ferrous brakes are sold for Rs. 23-30 per Kg, while aluminium brakes are sold for Rs. 70-90 per Kg. The metal recycling sites in Delhi are Mandoli, Sahadara, Samaypur Badali, and Anand Parbat. Key Toxicity: Asbestos fibres cause asbestosis, various other lung disorders, and even lung cancer.
Battery Terminal	Metal parts of battery terminals are sent for recycling and sold to scrap dealers for Rs. 20-25 per Kg. The ferrous metals are sold at Rs. 23-28 per Kg and brass or copper is sold for approximately Rs. 100-200 per Kg. Key Toxicity: Copper is extracted using acid, which causes pollution and affects the respiratory and dermal system of workers and others living nearby.
Switch	Non-functional switches are dumped by automobile parts dealers. They are picked up by street waste pickers who usually break them to recover the metal parts. Brass or Copper is sold for Rs. 100-200 per Kg. whereas ferrous parts are sold at Rs. 23-25 per Kg. Key Toxicity: Switches contain toxic mercury which is released into the environment.

Rubber	<p>Most of the rubber parts are dumped and some of them are picked up by street waste-pickers and sent for recycling. They are then sold to big recyclers at Rs. 2-5 per Kg.</p> <p>Key Toxicity: Rubber is used in furnaces, emitting several pollutants.</p>
Clutch Discs	<p>Clutch-discs can often be repaired and reused. Non-functioning clutch discs are broken to remove the asbestos layer which is dumped. Ferrous parts are sold at 23-28 per Kg to kabaris, which are then sold to recyclers through big scrap traders.</p> <p>Key Toxicity: Asbestos is dumped on the ground, or at best, in municipal dumps, exposing the public at large to this highly toxic material which causes asbestosis, various lung disorders, and even lung cancer.</p>
Electronic Parts	<p>Electronic parts, such as circuits, are sold to e-waste collectors, where they are tested for reuse. Parts, including PCB, are sold for Rs. 40 per Kg. Working parts are taken out and sold to refurbishers, and price variation depends on the working components that can be as expensive as Rs. 200 per Kg. Waste components are sold to e-waste dismantlers and recyclers.</p> <p>Key Toxicity: Extraction of precious metals is typically not done in an environmentally-safe manner.</p>

Wasted Parts

The following histogram shows specific parts of an ELV that are called problem parts by most dismantlers. These parts are of particular interest, as they are currently being disposed of and are, therefore, entering a waste stream, thereby representing resource inefficiency. Depending on the geographical area in which these parts are disposed of, and the quality of the waste collection systems in those areas, they may reach a landfill, a waste-to-energy plant, or they may remain in the environment.

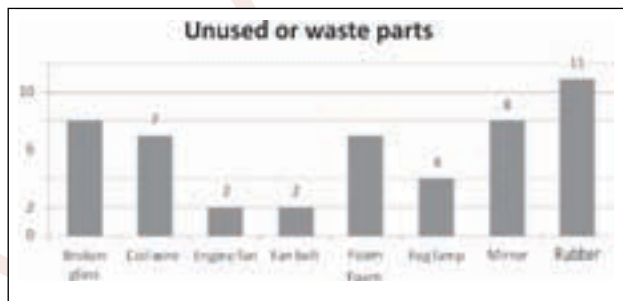


Figure 6: Unused or Wasted Parts of an End-of-Life Vehicle

Economic Aspects

Table 4 shows the economics of various parts that most dismantlers have to deal with. It is important to realise that the price of purchase of the vehicle to be dismantled is not included in this data. This table shows the disparity in profit margins related to recycling different vehicle parts. Although a lot of these are based on less than five data points,

those with a greater number of data points, such as the piston, show that opportunities of up to 150% margins are possible.

Table 4: The Economics of Various Valuable Parts

Part Name	Cost of Recycling	Selling Price	Margin	Margin of Recycling Cost
Cylinder *	3250	26000	22750	700%
Engine Lock *	18333	55000	36667	200%
Starting Assembly *	13500	40000	26500	196%
Silencer *	13000	33000	20000	154%
Piston	14400	36000	21600	150%
Temperature Meter *	8500	18500	10000	118%
Brake Shoes	14200	26000	11800	83%
Air Duct *	20000	36000	16000	80%
Speedometer *	12000	21000	9000	75%
Wiper *	7000	12000	5000	71%
Oil Pump *	17250	28333	11083	64%
Hydrometer *	9000	14500	5500	61%
Clutch Plate	25200	40500	15300	61%
Axle *	20000	30000	10000	50%
Sensor *	14500	21500	7000	48%
Steering Wheel *	14250	21000	6750	47%
Battery Accessories *	11000	15000	4000	36%
Water Pump *	15000	20000	5000	33%
Gear Box *	26666	35000	8334	31%
Engine	44444	56250	11806	27%

Entries marked with an asterisk (*) represent parts for which five or fewer recyclers volunteered their prices.

Economics of the ELV Business

The surveys show that the ELV industry is dominated by small businesses operating on limited capital. Figure 7 shows the breakdown by size of the respondents, clearly showing that over 70 percent of recyclers have a budget of under Rs. 50,000 per month for vehicle purchase.

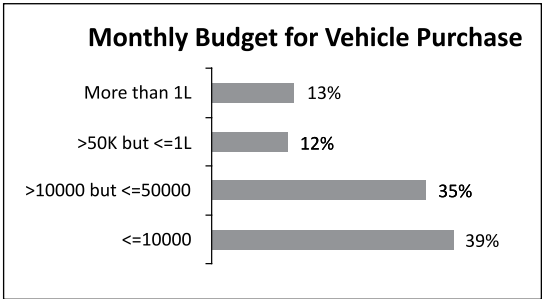


Figure 7: Monthly Budget for Vehicle Purchase

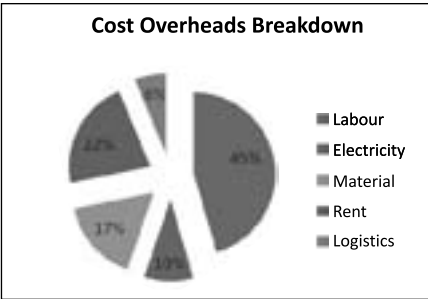
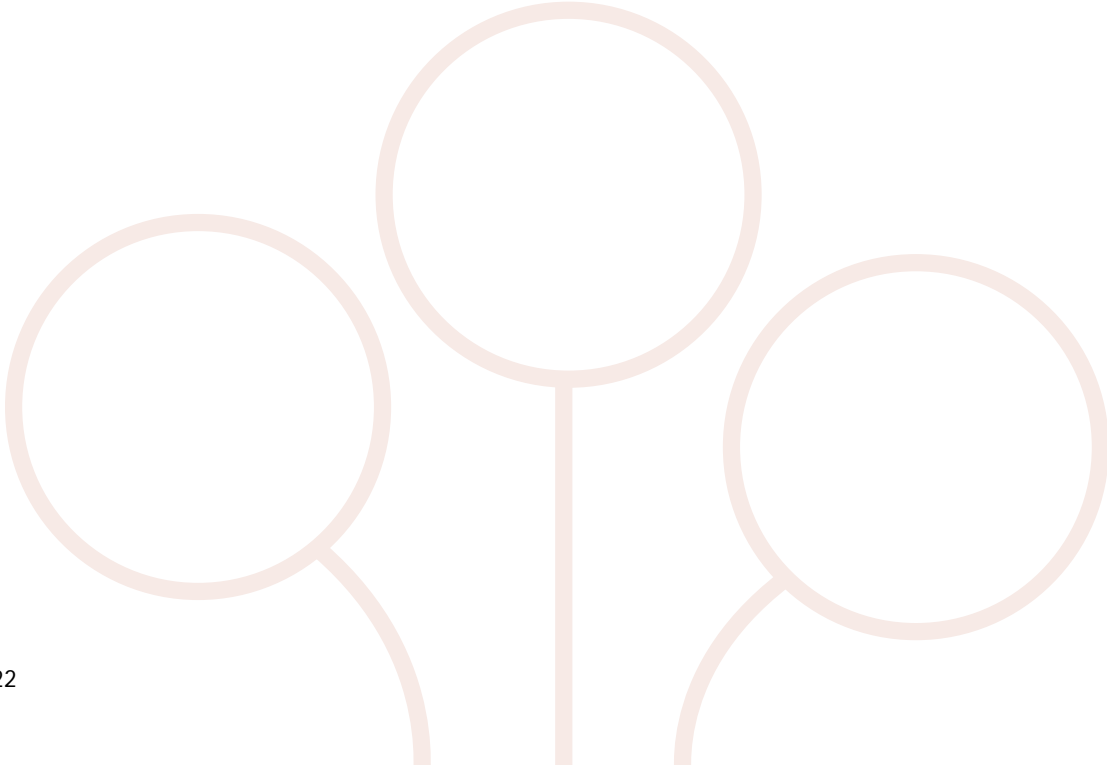


Figure 8: Average Cost Breakdown of Surveyed Dismantlers

Figure 8 shows the high proportion of dismantler costs spent on labour. Such statistics help to understand the high potential for job creation within this sector.

The Delhi case study explains this further. Across 28 valid observations in the city, a total of Rs. 417,000 was spent on labour, at an average of Rs. 14,893 per unit. Per the local minimum wage laws, and the generally understood minimum viable living wages in Delhi, this sum would allow for two workers to be hired on average. By extrapolating this data to the 3,200 ELV recycling units in Delhi, as recorded by Chintan in 2011, this comprises 9,600 jobs, including the labourers described above and the owner of the unit. It is, therefore, clear that the ELV sector also provides livelihoods, a role that must be augmented.



Perspectives

In this chapter, we capture the perspectives of the two main players in the current market - the recyclers as well as the disposers. In the absence of any regulation or policy guidance, the perceptions of these two sets of actors drive the transactions in the sector.

Recycler's Perspective

Aside from the data displayed in the Methodology chapter describing the movement of parts within the industry, the survey also included information concerning the dismantlers' knowledge of their own industries and their needs within it.

Outside input

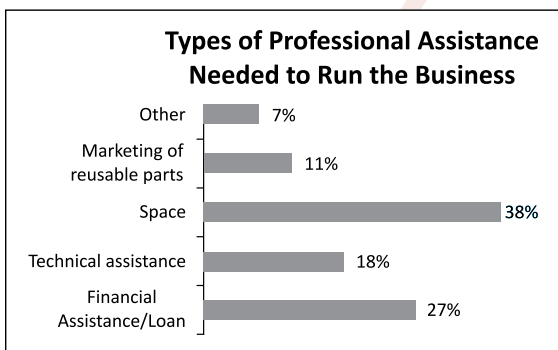


Figure 9: Types of Assistance Requested by Respondents

The dismantlers were asked what type of professional assistance would be of most use, if they were to be offered help from an external agency. Their responses are shown in **Figure 9**. Overwhelmingly, 38 percent of the respondents claimed that space was the main limiting factor to the expansion of their business activity. This issue has come to the fore, because the areas that dismantlers have used

traditionally were set up when they were on the outskirts of cities. These sprawling cities have now engulfed the dismantlers struggling to cope with the density and new zoning regulations around them.

Another large part (27 percent) of the respondents claimed that loans would provide them a greater ability to improve their business. Indeed, buying and selling vehicles is a capital-intensive business, which will be discussed in more detail in the following section.

A surprisingly small number of respondents claimed that technical knowledge would be appreciated. Only 18 percent believed they could benefit from training by an external body. It was clear to researchers on this project that all the participants in the industry are highly knowledgeable in their own sectors. It was astonishing to see how accurately and agreeably traders could decide prices for extremely specific parts, sometimes with variants in the hundreds.

An unexpected request for marketing came from 11 percent of respondents, who required assistance in bringing some of their parts to a suitable market. One respondent even claimed that car manufacturers were designing new parts with the intent of keeping *kabaris* out of work, through the practice of “planned obsolescence”. In referring to buses and heavy vehicles, one recycler said, “As TATA gets richer, we recyclers get poorer.” A certain amount of cooperation in the ELV industry, to ensure that parts which have reached the end of their life are reused, would be very helpful to the recovery of resources from vehicles.

Disposer's Perspective

The study surveyed 550 individuals who had recently disposed of their vehicle through the channels studied above. These people were asked how much they knew about the disposal process and different aspects concerning the economics of the process itself.

Disposal Method and Reason

Respondents were asked why they chose to dispose of their vehicle. The majority (54 percent) told us they simply wanted to purchase a new vehicle. This is significant, because it tells us that a certain number of our data points may not represent ELVs as per the definition, but may represent vehicles that could or would be reused after “disposal”. Indeed, this is compounded by data collected through the method of disposal question. It shows that 54 percent of respondents either exchanged their vehicle for a discount on a newer vehicle or simply sold their old vehicle to a friend or relative. This data seems to suggest that disposers only approach mechanics or used vehicle agencies when their vehicle is damaged or cannot be operated.

Personal Use before Disposal

Respondents were asked how long they had been using their vehicle before disposing of it. The data shows that 65 percent of respondents had been using their vehicle for

between three to eight years, this number itself spread perfectly evenly, with 33 percent in the range of three to five years, and another 32percent for six to eight years.

ELV Value

The following two graphs show the value recovered by the final disposer, broken down into two-wheeler and four-wheeler categories.

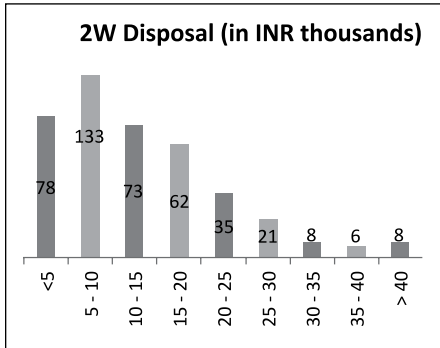


Figure 10: Value recovered by the final disposer in 2 wheel category

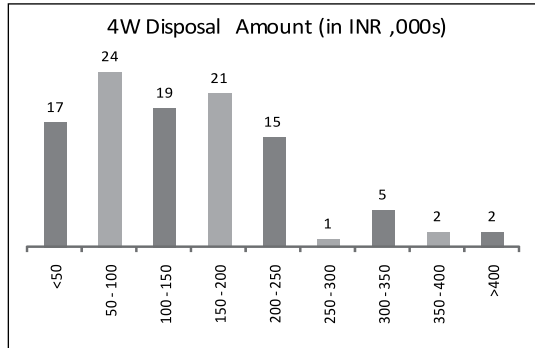


Figure 11: Value recovered by the final disposer in 4 wheel category

Value for Money

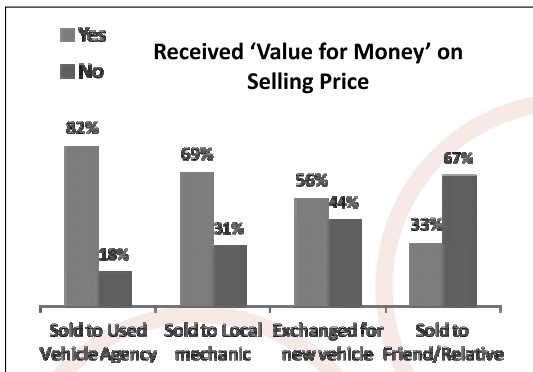


Figure 12: Value for Money Received for ELV

It is clear that disposers expect to monetise their ELVs. When asked whether they felt they received good value for money from their disposal, respondents could be categorised into four main groups, depending on the method of disposal they used. Figure 12 shows, as disposers moved further away from using the dedicated ELV purchasers, they were less and less satisfied with the value for money received for their vehicle.

This data reveals some valuable information. First, as people expect to be paid well, it is difficult to pass on any increased costs involved in the improved ELV recycling to the final disposer. Secondly, the data shows us how the consumer is increasingly satisfied as they deal with more specialised market participants. The specific used vehicle agencies provide customers with the greatest value for money, also suggesting they are the most efficient players in the market.

Key Observations and Recommendations

This study of the ELV industry has shed light on some of the complexities involved in dismantling and recycling ELVs, and we present some recommendations for the future. These recommendations can be broken into two main sections. First, recognition of the advantages offered to society by the informal ELV recycling sector, enabled by formalising and organising the work-flow process and the industry. Second, recognition by vehicle manufacturers of their responsibility to ensure their products are safely and efficiently treated at the end of their life, enabled by a program of Extended Producer Responsibility (EPR), common in many other countries. All these recommendations, however, have a cross-cutting impact on all three sustainable development goals: economic, environmental, and social.

Giving Due Credit

The informal sector in India currently ensures very high resource efficiency rates, and creates employment, in the ELV industry. It is essential, therefore, that mistakes made during the privatisation of the Municipal Solid Waste Management process, which lead to considerable losses of efficiency, are not repeated when dealing with ELV disposal. Recognising, and thereby formalising, the informal sector will allow the ELV industry to promote its currently efficient recycling process while concurrently allowing it to work on much-needed areas of improvement.

Facilitating Transfers of Vehicle Ownership

A major concern for ELV dismantlers and traders, especially those acting at smaller scales, is the bureaucracy involved in proving ownership of the vehicles they purchase. They spend large amounts of time and money pursuing documents from between government departments, sometimes in different states, simply to enable them to recover resources from a discarded vehicle. However, even at the small scale, most of

these participants are highly technologically literate and capable of using a network-based solution hosted online.

Chintan and GIZ, therefore, recommend that the Indian government facilitate the roll-out of a web-based platform to recognise a vehicle trade. Vehicle transfer operations can then be logged online, increasing efficiency savings in the industry and also allowing the government to gain a greater understanding of vehicle movements within the population.

Recognising Space Requirements as part of Local Urban Planning

Another major concern for the ELV sector is space. By its nature, the sector requires the presence of different types of participants in close physical proximity to allow efficient dismantling and reuse of different parts of a vehicle. In so many surveyed areas, the ELV industry could trace their beginnings to the outskirts of a city a number of decades ago, but were subsequently surrounded by, and even integrated into, sprawling urbanisation. This has many implications, both for the industry itself and for the city and its inhabitants. The sector obviously struggles to process as many vehicles as is necessary, but the city and its inhabitants are also hindered by the presence of the sector in the immediate vicinity.

Chintan recommends that the ELV industry be taken into account during the formulation of all city master plans and other local urban planning policy decisions.

Extended Producer Responsibility (EPR)

Improving the efficiency and efficacy of the work of the ELV sector in India requires an understanding of the toxic and waste materials that are currently not adequately treated. This study underscores a number of toxic components that are an integral part of vehicle components. These components are currently released into the environment due to a vacuum in both adequate legislation and opportunities to implement the necessary regulations.

Product Buyback

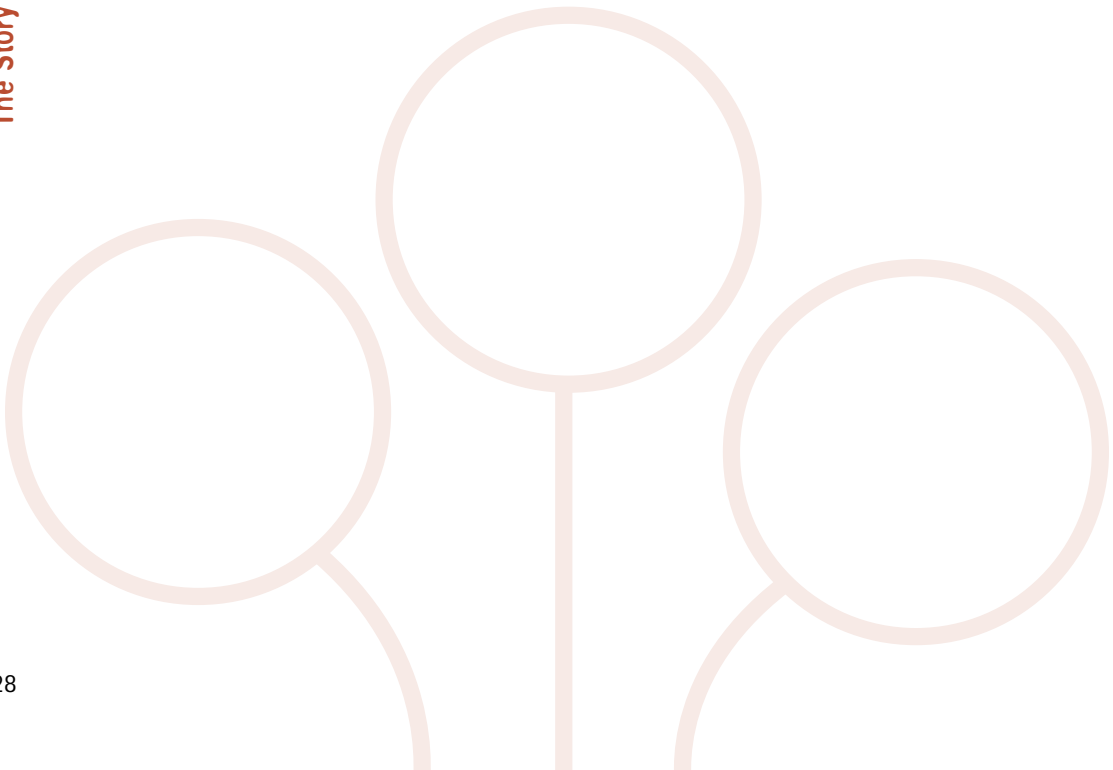
Chintan and GIZ recommend the introduction of an EPR strategy for the vehicle industry in India. Companies that produce or sell vehicles for the Indian market should be held responsible for the appropriate disposal of toxic and waste products from those vehicles, by forcing them to buy back those products. The reality of the situation dictates that these products would have to be purchased in order to cover the extra disposal costs that dismantlers have to incur. Such a market-based approach would also ensure that the scheme is taken up rapidly and efficiently by ELV participants, as opposed to legislation-only options.

Dismantling training

Although the ELV industry is highly self-trained and knowledgeable about dismantling current vehicles, some respondents within the industry cited the need for help with technical training. When questioned further, it was clear these dismantlers were relating to a struggle to keep up with the increasingly complex parts used by vehicle manufacturers.

Chintan proposes that the EPR scheme include a focus on training the ELV dismantlers and recyclers to deal with any new products. In many other countries, vehicle manufacturers are required to produce detailed dismantling instructions for any vehicle that they produce. In addition to merely producing such detailed instructions, in India, these manufacturing companies should be encouraged to take the lead in disseminating this information.

End-of-Life Vehicles are an economic and environmental challenge in many parts of the world. In India, this report shows that the situation can be turned into an opportunity to handle such vehicles, to safeguard the environment, create and upgrade informal livelihoods, and promote the most efficient and optimal use of components and materials to support resource efficiency .





About this Study

This report summarises the results of two surveys and a number of field-based research missions carried out in the End-of-Life Vehicles (ELV) industry in Northern India. The research aims to present a clear picture of what happens to a vehicle in India at the end of its life-cycle. As a first step, a schematic materials flow has been developed through a participatory process with users, dismantlers, and recyclers. The study shows that the ELV industry consists of many different participants, who constantly interact with each other in a complex, interdependent process. The study provides a better understanding of the economics of the recycling of ELVs in India, as well as an insight into the attitudes, knowledge, and practices of the ELV handlers. The major focus of the study is the economic, environmental, and social challenges that emanate from a change in status quo. For the environmental issues, the report identifies a number of different individual vehicle parts as either waste (i.e., cannot be reused or recycled) or posing environmental danger (i.e., toxic to either humans or wildlife), according to the way they are currently treated by the informal sector. The report ends by presenting a series of recommendations on how to improve the resource efficiency of the ELV industry in India. It proposes a system to recognise and formalise the work of a currently largely informal sector, and ways for vehicle manufacturers to take responsibility for the products they release in the market.



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