

End of Life Vehicle (ELV) Management Ecosystems in Malaysia

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Abstract – *Serious discussion on End of Life Vehicles (ELVs) in Malaysia began in 2006 when research on the development of the automotive industry was undertaken. The interest increased following the introduction of the National Automotive Policy (NAP) in 2009. This research paper describes ELVs from the perspective of industry players based on their direct experience and participation in the industry through comprehensive observation by looking at the practices of ELV management in Malaysia. This research paper will highlight the existence of some of the innate problems facing the ELV management in the country along with suggestions for approaches and solutions to enhance Malaysia's potential as one of the most important industry players in the automotive segment in the Asian region.*

Keywords: End of Life Vehicle (ELV), automotive industry, Malaysia

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1.0 INTRODUCTION

As an industry player who has been involved in the automotive recycling business for more than 20 years, the authors would like to share their perspective on the current state of the ELV ecosystem in Malaysia. Today's vehicles are considered a daily necessity and production are increasing every year. This trend has also led to an increase in End-of-Life Vehicles (ELVs) and this cycle will continue as more new vehicle models entered the market. Each country has different rules and regulations regarding ELVs. This is because of the different automotive environments in each country, especially in the automotive-related regulations. The ELV according to the European Commission (EC) uses three elements related to relocation, pollution, and vehicle waste (Edwards, 2007).

Researchers also have given several definitions of ELV. Sakai et al. (2014) described ELV as the deregistered car that will undergo treatment or recycling through appropriate processes within the country, while Lashlem et al. (2013) have stated that a vehicle can produce an ELV in two ways, both natural (wear and tear) and premature (accident, fire, flood or due to vandalism damage). According to Mohan and Amit (2018), ELV broadly refers to activities such as the collection of ELV, separation of parts and components, processing for product recovery, and waste disposal. Furthermore, Thierry et al. (1995) defined ELV as product recovery that encompasses activities such as reusing, repairing, refurbishing, remanufacturing, cannibalization, and recycling.

In addition, the Chartered Institution of Wastes Management (CIWM) from the United Kingdom interprets ELV as motor vehicles that are categorized as waste including their components and materials. Waste is defined as anything that is discarded, intend to discard, or are required to discard includes material being sent for recycling or reuse.

In Malaysia, the vehicle life span is between 10 and 15 years, after which they will enter the retired phase (Amelia et al., 2009; Lashlem et al., 2013; Ahmed et al., 2014). Besides that, the two conditions that caused vehicles in Malaysia to reach the ELV state were if the vehicle is declared as “total loss” due to a road accident or an old car that was considered a scrap car by the age of 25 years and beyond.

Meanwhile, the neighboring country Singapore uses the COE (Certificate of Entitlement) or permit for its people who want to own a vehicle. This permit has an expiration date of five or ten years depending on the type of vehicle. Vehicles that have the COE been terminated are usually not renewed due to their high price and are considered as ELVs. However, some of these vehicles were illegally brought into Malaysia and sold as “clone” cars by unscrupulous parties. According to the local automotive analyst and the author of Mechanical Engineer Portal, Irwan Asri Mohd Nor (Mohd Nor, 2016), cars that are considered ELVs in Singapore obviously cannot be used in Malaysia due to the vehicle import law (Approved Permit – AP).

Moreover, Japan, as the most influential source of automotive in the ASEAN region, introduced the Automotive Recycling Act in 2005 to manage ELV waste (Michikazu, 2017). In Japan, vehicles with ELV status are still considered useful because of the precious metals and parts. From roughly five million cars that are disposed of every year, about a million of these are exported as second-hand vehicles, while the remaining four million are sent by automobile retailers to auto dismantlers and scrap metal companies to be processed for reusing and recycling (Koshiba, 2006). Malaysia imports a sizable number of cars that are categorized as ELVs in Japan and sold them as reconditioned cars in Malaysia.

2.0 ELV TRANSFORMATION IN JAPAN

The practice in Japan is that car owners themselves are responsible to dispose of their vehicles once the vehicles have reached the end of their life span. Consumers are expected to pay a certain amount of money to recycling firms to process their vehicles for scrap (Michikazu, 2017). Japan is regarded as a leading example in Asia and other developing countries in the development of systematic and quality ELV management (Michikazu, 2017).

Japan's transformation into its ELV policy has grown exponentially through the approaches in the areas of research, demand, and technology development. ELV activity in Japan is also based on the government's role in encouraging its citizens to send vehicles with ELV status to go through the process of dismantling. However, there are also vehicles with ELV status in Japan that are converted into reconditioned car status or used cars including popular models such as Honda, Mitsubishi, Daihatsu, Toyota, Nissan and Mazda. Malaysia has also become one of Japan's leading importers of used vehicles and spare parts (Jawi et al., 2012). In addition to being an importing country which resulted in the dumping of vehicles and spare parts from Japan, the advantage that Malaysia has is that it is not only an importing country but also re-exporting its spare parts to other countries.

This is proven by a study published by Michikazu (2017) which states that the import of used car parts into Malaysia is huge where there are more than 5,000 companies involved in this business especially in the Klang Valley. These companies import about 5,000 containers each month. Some of the most commonly imported items are car parts, or components such as engines, gearboxes, etc.

3.0 ELV IN MALAYSIA

By end of 2020, Malaysia is estimated to have a total volume of 31 million units of vehicles. Azmi et al. (2017) in their study predicts that by 2030, the private vehicle market will reach a saturation point when as many as 12 million active vehicles will be on the road. This scenario will result in the emergence of half a million vehicles with ELV status in Malaysia (Azmi et al., 2017).

In addition to the increasing number of local vehicles with ELV status, the number of ELV status vehicles imported into Malaysia has also increased as Malaysia is one of the countries that are actively importing ELVs from other countries, especially from Japan. Michikazu (2017) in his study stated that Malaysia imports a large number of vehicle spare parts and this makes Malaysia an important hub for auto parts trading activities in this region.

Activities in the ELV recycling industry in the country involve several key activities such as decommissioning, repair, part separation, and disposal. The source of these ELV disposal activities is derived from domestic or imported vehicles from overseas especially from Japan. According to the Ministry of Transport, there are 31.2 million units of registered vehicles in Malaysia. This number also refers to cars, motorcycles, and commercial vehicles such as trucks and buses (Paultan.org, 2020). This situation will correspondingly increase demand for vehicle spare parts.

Generally, vehicles with ELV status will be taken to the ELV processing site for resolution purposes. The remaining components of the vehicle will be stored as spare parts or waste. The ELV treatment process involves inspection, disinfection, and disassembly at the facility dedicated for this purpose. This process will eventually produce products that can be recycled or reused in addition to some by-products. The ELV components that are still in good condition fall into the category of reusable products. The recyclable ELV parts will be segregated based on the type of material and will then be sold to other industries such as iron, plastic, and others. The by-product of ELV treatment process activity that cannot be used will go through the disposal process.

Raja Mamat et al. (2018) also noted that the management and aspects of ELV recycling in Malaysia are carried out by 5,000 small companies affiliated with the Malaysian Automotive Recyclers Association (MARAA). In 2011 Malaysia Automotive Robotics and IoT Institute (MARii) also recognized the role of MARAA as one of the key associations and organizations in controlling industrial development and recycling centers (MAARA, 2012).

However, given that Malaysia is regarded as one of the countries that are still in the process of developing the recycling industry, there are a number of issues that have been identified which are affecting this industry's development initiative. This issue occurs when it is found that the automotive recycling business in Malaysia is unregulated and it is being managed without systematic and regulated ELV management activities (Raja Mamat et al., 2018). Some of the problems and challenges regarding ELV:

- i. Lacking in the aspects of procedures and standards in the industry.
- ii. Lack of professional approach as well as systematic processing controls.
- iii. Lack of awareness, knowledge and training aspects among recycling industry players.
- iv. Lack of emphasis on the quality and safety of recycled spare parts.
- v. Weak aspects of control over issues and environmental impacts.
- vi. Weaknesses in the aspects of inventory and the provision of appropriate and effective databases especially information on used spare parts.
- vii. Weaknesses in waste management and control.
- viii. Weaknesses in terms of certification and standard operating procedure (SOP).

In addressing some of the key issues that arise in the management of ELVs, the National Automotive Policy (NAP) is seen to play a pivotal role in determining the direction of the ELV vehicle recycling and parts replacement industry in Malaysia (NAP, 2014). However, by 2020, the government is still not planning to implement any definitive ELV policy in Malaysia as it considers the timing for the introduction of this policy is still inappropriate for society (Sinar Harian, 2019). This situation indicates that ELV management activities in Malaysia are still largely dictated by the activities of small firms and industry players such as local recycling companies.

Malaysia does not have any specific policies regarding ELV management. This is because all ELV waste management has been included under various laws and regulations such as Solid Waste and Public Cleansing Management Act 2007 (Act 672), Solid Waste and Public Cleansing Management Corporation Act, 2007 (Act 673), the Local Government (Amendment) 2007 (Act 1311), Environmental Quality (Scheduled Waste) Regulations 2005 and Environmental Quality (Assigned Premises) (Scheduled Waste Processing and Disposal) Regulations 1989 (Wahab et al., 2017). The failure of the government to establish specific ELV-related acts can be seen in the following factors.

3.1 Business-Government Factor

The automotive industry in Malaysia has grown rapidly since the inception of the National Car Project (Proton) in 1985 followed by the Perusahaan Otomobil Kedua (Perodua) project in 1993. The dumping of vehicles has led the government to introduce the National Automotive Policy (NAP) 2006 to formulate the strategic direction of the automotive industry under the Third Industrial Master Plan (IMP3). However, this policy was withdrawn by the government as it received some resistance from the private sector.

The NAP was subsequently revised in 2009 taking into account the views of industry players. As a result, Proton and Perodua have agreed to provide an RM5,000 rebate to the public who wants to change their vehicles (Raja Mamat et al., 2018). According to the then Deputy Finance Minister Datuk Chor Chee Heung, a total of 31,046 vouchers valued at RM155 million were issued between March 10, 2009, to November 1, 2009. This fund was described as an economic stimulus package introduced by the government to boost the automotive market. The survey received a positive response from industry players and the government has again sought to introduce NAP in 2014.

The government has also banned the importation of six types of vehicle components such as brakes, brake hoses, brake pumps, brake linings, tires, and batteries (MAARA, 2012). However, it is believed that some of these prohibited items are still being smuggled into Malaysia and also were sold as “half cut” (used) car accessories and parts at market price. The goods code was usually modified and declared as spare parts to avoid detection by the authority.

3.2 Government-People Factor

At this stage, the challenge usually involves what the government thinks is right for the people and what the people want from the government. For example, if the government introduced a prohibition policy on importing vehicle spare parts from abroad, the people would not be able to replace vehicle components that suit their financial capabilities. This is what happened to the NAP 2006 where the government’s intention to introduce the policy was retracted due to public dissatisfaction (Nawawi et al., 2020).

Mustapa Mohamad, at that time holding the portfolio of the Minister of International Trade and Industry (MITI), stressed that the government would not introduce the NAP as the people were not prepared to accept the policy then (The Malaysia Reserve, 2018). However, it is believed that the government will eventually introduce a formalized policy on ELV in due course (The Malaysia Reserve, 2019).

3.3 People-Businessman Factor

Most people are unaware of the difference between the original components, fake or second-hand parts. Normally when someone goes to a vehicle repair workshop, he or she is asked if they want to replace the affected spare parts with original components or with the so-called “non-original” parts (mostly from Taiwan) or used parts. The people’s lack of understanding or knowledge of the spare parts components and the quality of the type of spare parts sold to them encourages the industry players to exploit the situation where exorbitant prices were often charged for sub-quality products. Some dealers take advantage of people’s naive attitude toward the price of vehicles’ spare parts by giving them the same item and only changing the packaging to reflect the difference in goods used as replacement components.

For the people, they wish to find cheap and quality spare parts for the continued mobility of the vehicles they use. However, the cost of replacing expensive original components has led them to opt for parts from Taiwan, Thailand, or China.

3.4 Policy-Government Revenue Factor

In this regard, the government has collected tax revenues paid by industry players in the ELV industry. Policies that have been formulated, recognized and implemented will keep the industry players in line with those policies. A well-designed policy will give the government some advantages. Some industry players will pay taxes to the government but at the same time, various methods will be used to reduce the amount payable to the government while maximizing their profits. This gave birth to “creative traders” who came up with various ways to reduce the tax imposed by the government on them.

3.5 ELV-Environment Factor

ELV management and its impact on the environment are difficult to monitor and have become a global issue with high vehicle production around the world every year. An international workshop entitled “International Workshop on 3R Strategy and ELV Recycling 2012” was held in Nagoya, Japan in September 2012 to gather data and to discuss the 3R (reduce, reuse, and recycle) policies and ELV recycling systems, their background and present situation, outcomes of related policies and programs, the framework of recycling and waste management, and case studies on related topics in several countries and regions, as well as the essential point of comparison (Sakai et al., 2014). According to Sakai et al. (2014), participants for this international workshop were from Belgium, Germany, Italy, the United States of America, Australia, China, Indonesia, Korea, Vietnam, and Japan. 3R can be defined as below (JICA, 2006):

- i. **Reduction** at source is defined as the reduction in the amount of waste that will enter into the waste stream through changes in lifestyle and/or manner of consumption, improvement of manufacturing processes, green purchasing, and so on;
- ii. **Reuse** is defined as the multiple uses of a product in its original form, for its original purpose or for an alternative, with or without reconditioning; and
- iii. Material **Recycling** (or Recovery) is defined as the utilization of waste for other purposes by processing (including segregation, washing, melting, transforming, etc.), but most of the fractions of waste shall be utilized as materials for other purposes.

3R issues in Malaysia are difficult to manage because most municipalities were facing the problem of new disposal sites as most of the existing disposal sites were nearly exhausted (Mohd Nasir, 2000). This situation makes illegal dumping of vehicles continue to increase, which is an easy way to dump their unused cars which at the same time is harmful to the environment. In this case, the responsibility of ELV recycling should not be burdened on users alone because manufacturers, retailers, recyclers, users as well as government should all work together to solve this problem (Azmi et al., 2013).

The process of making the vehicle itself used a lot of natural materials and energy before it was marketed. Materials such as alloys, rubber, mirrors, plastics, paints, and so on have to be manufactured in the process of making a vehicle as well as through environmental polluting processes. Vehicles that have been categorized as ELV do not mean their environmental impacts have been negated. Its negative by-products such as plastic parts, batteries, and other non-degradable products are still in the environmental ecosystem.

4.0 OPPORTUNITIES IN ELV

ELV's current position and activities in Malaysia provide local industry players with either recycling or vehicle importing companies and components spare parts a chance to gain economic opportunities and resources in the face of loopholes and weaknesses in the legal and policy aspects of ELV management in Malaysia. If Malaysia leverages the experience of ELV management from Japan, the government will be able to generate revenue that will contribute to economic growth as a result of the growth of the automotive industry. Good and systematic ELV management can also maintain environmental sustainability and better control over the industry and natural resources.

The ELV activities taking place in Malaysia today are based on the growing influence of the foreign automotive industry especially Japan which is active in exporting its vehicles and spare parts to ASEAN countries particularly Malaysia, Thailand and Vietnam. From the aspects of the recycling industry as well as the used parts industry, Malaysia is largely supported by some firms that have a foundation in recycling management systematically through the use of modern machines and technologies. However, there are also recycling firms that are still actively using human resources in the work of dismantling, isolation and disposal.

Components or materials produced from ELVs such as steel, copper, rubber, plastic, etc are of economic value to other industries. ELV management at the landfill not only serves as a center for disposing of ELV vehicles but the materials produced will be sold to other downstream industries that require such materials to support a wide variety of other products based on the stated materials. The reuse of these materials will further reduce the dependence on natural resources.

In addition to the emergence of ELV recycling centers and government bodies that can guarantee the quality of vehicle components, ELV management in Malaysia will also open up new opportunities in site land rental activities to temporarily place vehicles with ELV status before certain processes. This activity will benefit landowners or large-scale warehouses to support ELV industry needs.

Opportunities in technology development as a result of ELV activities will also open up opportunities for local and international industry players to create a more specialized vehicle replacement hub. With the technological development of the Industrial Revolution 4.0 era today, the center and hub of spare parts will have the advantage of a supervised capacity through the advancement of data analytics and artificial intelligence (Artificial Intelligence – AI). With the advent of this technology, the transfer and sharing of technology will create more employment opportunities which will open up opportunities for the production of professionals in the field of technology. Malaysia will also be expected to generate more subject matter experts (SMEs) in the fields of science, automation and AI.

5.0 RECYCLING ECOSYSTEMS – ENVIRONMENTALLY FRIENDLY

Recycling involves the process of collecting and processing the product to be disposed of so that it can be reused. The product to be disposed of is of biodegradable and non-biodegradable type. Recycling biodegradable products is simple and inexpensive as it involves only organic elements. Even without the recycling process, the disposal of this biodegradation product

would not have any impact on the environment. However, the removal of non-degraded product types has a significant impact on the environment.

This problem of non-biodegradable product disposal occurred at the start of the industrial revolution in the late 1700s. Starting with the textile industry, it is spread in other industries such as the oil and gas industry, electrical and electronics, manufacturing, and automotive industries. There is a dependency trend either directly or indirectly from one industry to another and each produces a by-product or non-biodegradable end product.

5.1 Importance of Recycling

In addition to the problem of the production of non-biodegradable end products, some side effects are harmful to the environment if not treated before being released into the environment. Every activity in any industry that has produced the final product has the potential to produce side effects that can affect the environment. In fact, environmental impacts occurred during the early stages of the product produced during the procurement of raw materials and factory construction.

The process of recycling or the treatment of harmful side products is important for preserving environmental balance. The increase in waste is closely related to the increase in the human population and the products in the market. If left unchecked, it could harm the environment, especially in terms of water, air, and soil quality. These three elements are very crucial for humans and other living things for their survival. The recycling or treatment of harmful side products can reduce the environmental impact resulting from the activities of these various industries.

5.2 ELV Recycling

With the launch of new vehicle models every year, the automotive industry's rapid growth has been one of the major contributors to ELV disposal in several developed and developing countries. Malaysia is one of the countries where ELV dumping hubs do not have special policies in managing ELV recycling activities. At present, the recycling process does not have any government-regulated standards and procedures as well as non-systematic processes. Even the environmental management disadvantages of ELV by-products that are harmful such as liquids and gases should be noted. To overcome this problem, an environmentally friendly ELV recycling ecosystem is required by involving seven key components namely electronic waste, metal waste mixing, soldering, ferrous and non-ferrous metal residues, plastic waste, vehicle component waste, and waste consulting.

6.0 RECOMMENDATIONS OF ELV MANAGEMENT ECOSYSTEMS IN MALAYSIA

6.1 Creation of ELV Recycling Zone

ELV management in Malaysia will be more systematic by establishing a centralized zone for the operation and monitoring of all ELV-related activities. For this purpose, the government should allocate a special zone dedicated to the management and development of a viable and dynamic ELV industry not only for Malaysia but also for the ASEAN region. The ideal site for this set-up is a 1,000-acre land located along the East Coast Rail Link (ECRL) route. It aims to

facilitate public and customer access to this centralized zone by using ECRL services. In addition, ECRL cargo services can also benefit ELV industry players. Centralizing the operation and monitoring of ELV activities in a dedicated zone is an approach aimed at upgrading the ELV recycling industry to a new dimension to meet the National Automotive Policy targets.

6.2 ELV Recycling Zone Activity

The ELV Recycling Zone will be the place for local ELV recycling purposes and imports through industry-approved procedures following established standards and through a systematic process to ensure the quality of recycled components as well as maintaining environmental equipment before exporting abroad or marketed for local use (Figure 1).

Activities in this zone include ELV treatment, specialist training, ELV recycling business guides and quality component sales along with guarantees. This zone will be a place where local and overseas ELV players conduct transactions involving four subsets of activities namely import, export, the local market, and ELV treatment facilities. These activities will be driven from the ELV Recycling Zone through standards and procedures established according to industry requirements as well as enforcement, database creation, documentation, inspection, training, and education.

Imported or local ELVs must first go through the process prescribed by the ELV Recycling Zone for the purpose of treatment at an accredited facility before it is approved for export or sale to the local market. Existing ELV treatment facilities also need to adhere to procedures and standards set before being given credentials for treatment of imported or local ELVs. Among the main processes of ELV treatment include the extraction of pollutants and hazardous materials such as oil, gasoline, liquids and batteries, the preservation of reusable ELV components such as engines, gearboxes, alternators and the like and the maintenance of recyclable materials in the forms of ferrous metal materials, non-ferrous metal materials and non-metallic materials.

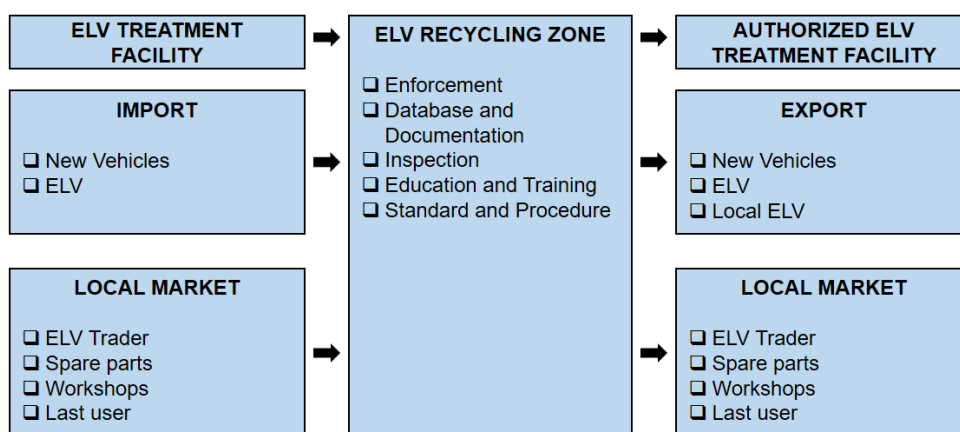


Figure 1: Recycling zone

6.3 Implementation

The process of implementing the ELV Recycling Zone requires the involvement of various government agencies, local and overseas ELV industry players, local and foreign independent organizations that play a role in the ELV industry, universities and other institutions for education and training purposes (Figure 2). The Ministry of Transport is responsible for approving the proposed ELV Recycling Zone initiative. Subsequently, a collaboration between organizations is created in the context of expertise in database management, consulting, training, service, and certification.

Technical consultations, standards, procedures, and certifications are conducted through the guidelines outlined by the Malaysian Institute of Automotive, Robotics, and IoT (MARii). In addition, global collaborations between established ELV organizations such as the U.S.-based Automotive Recyclers Association (ARA) have been created for the purpose of sharing experiences. Workforce education and training programs for ELV activity management can also be implemented through collaboration between local universities. In addition, the involvement of local ELV industry players in the success of ELV Recycling Zone initiatives can be accelerated through the involvement of the Malaysia Automotive Recyclers Association (MAARA), an organization in which ELV industry players are registered.

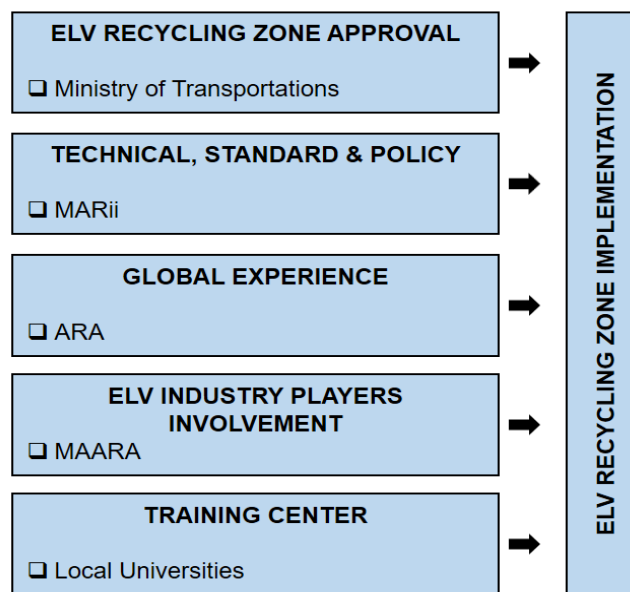


Figure 2: ELV recycling zone implementation

7.0 THE DATA-DRIVEN APPROACH

7.1 Data Sharing

The variety of activities undertaken in the ELV-related industry generates very large and varied amounts of data. Currently, data generated through activities that are recorded electronically at various levels of the organization are silos or separate and are used solely for the purposes of interaction management, perception management, electrical automation, and reporting.

To date, there has been no attempt to integrate all these data in a structured form. The creation of the ELV Recycling Zone through a data-sharing initiative has enabled the integration of data from all organizations involved. Data integration can be utilized to optimize digital operations in this zone in terms of action management, enforcement management, and sentiment management. In addition, these partnerships can also assist in the process of data analysis for forecasting purposes. Furthermore, the inventory information of the ELV management facility system from the industry players can provide information on the supply of recyclable ELV components and the residuals generated.

7.2 Data Modeling

The process of data integration between the organizations involved requires a clear model taking into account the types of activities that generate data (Figure 3). This includes import and export applications, grant approval and enforcement, online trading, and inventory processes. The integration of the data obtained will form a reservoir for the proposed Recycling Zone.

Import and export applications through the Royal Malaysian Customs Department’s declaration system include record date, cargo details, country of import and export activity, port name and HS code (Harmonized Commodity Description and Coding System). Acquisition of this data enables the monitoring of the amount of ELVs imported and exported and thus controls the dumping of occurrences. Records of approvals and enforcement from various government agencies for ELV-related activities can be used for planning and optimization purposes. Data from trading systems can also provide guidance on the expected demand for components in the market.

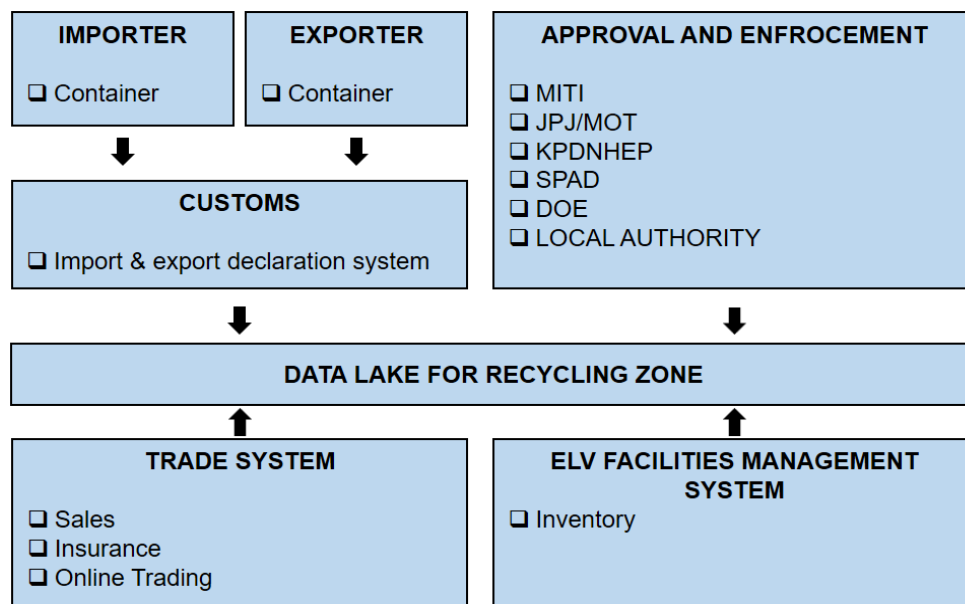


Figure 3: Data modeling

7.3 Big Data Analysis

The data storage for the proposed Recycling Zone can be utilized using a public data analysis approach (Figure 4). For example, industry players would be very keen to know the expected demand for the type of vehicle component over the next five years. Such information would enable them to construct a sound business plan in importing and stocking the right components to meet market demand. The data extracted from the data reservoir for this purpose include the volume of registered vehicles, accident records, the type of damage commonly reported and the like. This will be analyzed to produce descriptive, diagnostic, predictive and prescriptive cases. Many other cases can be analyzed depending on the needs of the organization involved.

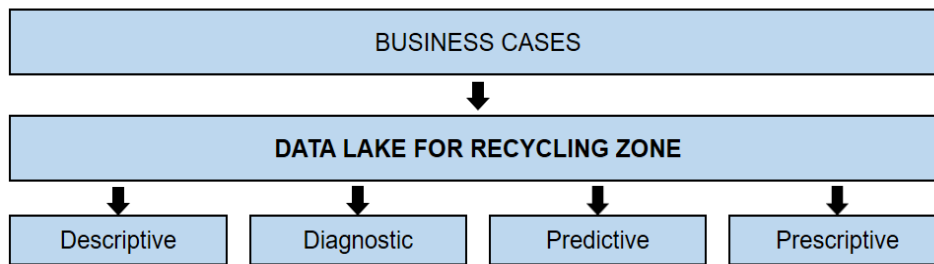


Figure 4: Big Data analysis

8.0 CONCLUSION

The development of the Malaysian Automotive Policy has led to the rapid development of the automotive industry in Malaysia. The rapid growth ultimately requires appropriate and specific policies and laws with the ultimate objective of spurring the industry players in shaping more significant directions. This is mainly in the management of ELVs which involves increasing the number of local vehicles as well as the importation of vehicle spare parts which have the potential to generate substantial revenues for the government as well as the industry. Research and development carried out by several recycling firms and organizations such as MAARA specializing in ELV management have the potential to assist the government in providing a more effective and appropriate framework for the vehicle ecosystem in Malaysia. In addition, ongoing research and development programs on reusable design will be required to enhance the long-term reliability of the automotive component. Understanding the economic benefits of reuse is an important element that can boost government revenues while opening new opportunities in a more competitive automotive world.

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