Jurnal Kejuruteraan 36(5) 2024: 1839–1847
https://doi.org/10.17576/jkukm-2024-36(5)-05

# A Study of the Implementation Factors of End-Life-Vehicle Policy

Nur Anis Izzaty Zainuddin[a], Norashikin Samuri[a], Muhamad Razuhanafi Mat Yazid[a]*, Rozmi Ismail[b],Rosniza Aznie Che Rose [b], Zurinah Tahir[b], Nur Atiqah Suparjo Noordin[c] & Charli Sitinjak[c]

[a]*Jabatan Kejuruteraan Awam,*
*Fakulti Kejuruteraan dan Alam Bina, Universiti Kebangsaan Malaysia, Malaysia*

[b]*Fakulti Sains Sosial dan Kemanusiaan, Universiti Kebangsaan Malaysia, Malaysia*

[c]*Faculty Teknologi Informasi, University Science and Technology Computer, Semarang, Indonesia*

**Corresponding author: razuhanafi@ukm.edu.my*

*Received 22 September 2023, Received in revised form 28 April 2024*
*Accepted 28 May 2024, Available online 30 September 2024*

ABSTRACT

*Vehicles with a lifespan exceeding 10-15 years are classified as End-of-Life Vehicles (ELV). Since widespread use of ELV could potentially pollute the environment, it is essential to formulate an ELV management framework to deal with this issue. This study aims to understand the laws related to ELV, study its implementation in other countries and measure public opinion concerning implementing ELV recycling in Malaysia. Therefore, the study surveyed 200 respondents and analysed the data using the Statistical Package Software for Social Sciences (SPSS). The results showed that the employment sector and estimated income significantly influenced knowledge of solid waste management and end-of-life vehicles, community readiness and community attitude, with a value of 0.001 (less than 0.005). The results revealed that most respondents (68.5%) agreed with the ideas concerning ELV, while 31.5% disagreed. The researcher concludes the study with recommendations to the relevant parties, including the government, to improve the final vehicle policy life before its full implementation.*

*Keywords: Vehicle recycling; vehicle recovery; end-life-vehicle*

## INTRODUCTION

Society's need to use vehicles is constantly growing even though vehicles have multiple environmental impacts throughout their lifespan, including resource and energy consumption, waste generation during production and use, and disposal after their useful life (Kanari et al. 2003). A vehicle is considered to reach the end of its useful life (ELV) when it is too old, cannot be used due to a severe accident, or is too costly to repair (Aishah et al. 2020). An end-of-life vehicle (ELV) has reached its maximum use limit of at least ten years. There are two categories of ELVs: those that have reached their useful life and damaged vehicles that can no longer function. Vehicles over their use limit should not be used and must be properly disposed of to prevent environmental pollution.

Malaysia has been seriously considering implementing an end-of-life vehicle policy in Malaysia. However, the directives or legislation on end-of-life vehicles have not been implemented because the public is not ready for its enforcement and rejected the end-of-life vehicle policy (Azmi et al. 2013). The primary aim of end-of-life vehicle recycling is to reduce the impact of ELV waste on the environment, preserve the environment, and achieve the UN's Sustainable Development Goals to establish sustainable cities. Implementing an end-of-life vehicle policy can reduce environmental pollution and ensure sustainability. However, public support is essential to ensure its effective implementation.

This research investigated the factors impeding the implementation of the policy on end-of-life vehicles. It aims to answer the following research questions: (i) What is the level of community awareness concerning end-of-life

vehicle recycling? and (ii) What are the public's views on implementing the ELV policy? Two hundred respondents took part in the survey conducted in Ipoh and its surrounding areas. In addition to identifying the public's awareness of ELV, the study exposed them to the issues concerning ELV. The ultimate aim of the research is to provide recommendations for improving the current ELV policy. It is crucial to consider the possibility of conducting future studies to broaden the research focus and conduct comparative studies across different countries.

## LITERATURE REVIEW

There is a need to inspect end-of-life components or systems to determine whether they require maintenance or replacement. Vehicles 15 years old or older should undergo a comprehensive inspection to determine their roadworthiness and ensure the drivers' or riders' safety (Mamat et al. 2014). The Road Transport Department (RTD) of Malaysia (Jabatan Pengangkutan Jalan, (JPJ)), under the Ministry of Transport, deregisters the vehicles to be sent to scrap yards (Raja Mamat et al. 2016). Among the laws and policies that determine the management of ELVs are the regulations adopted by the European Commission, the ELV recycling law in Japan and the technical strategy for recovering and using vehicle goods in China. Additionally, ELV management must consider the entire ecosystem, from the owners of the vehicles to the appropriate facilities and centres for disassembling, recycling, remanufacturing and other processes (Abu Kassim et al. 2020). The next stage is removing hazardous parts like batteries and airbags from the vehicle body (Wong et al. 2018). The present practice is to remanufacture automotive parts and reuse the clutches, brake shoes, engine blocks, water pumps, carburettors, starters, alternators and other components. A part of the replacement objectives is reusing and remanufacturing the components (Amelia et al. 2009).

The US manages ELV recycling under current environmental protection legislation, while the EU, Japan, Korea and China have established legislation for ELV recycling programmes (Mohan et al. 2020). China adopted a law governing ELV elimination and recycling in 2001 (Chen 2005). Recycling automobile shredding residue (ASR) is difficult because ASR has a high calorific value, ash concentration, heavy metal contents and undifferentiated fine particles. Because the statutory ELV system in most countries sets a recovery rate of greater than 95%, a higher ASR recovery efficiency is necessary to meet this goal and recycle the collectable parts and metals (Sakai et al. 2014). In a controlled ELV recycling system, the dismantlers collect the ELV from the end user at the beginning of the recycling chain. They separate the cars into different sections and sell them to particular salvage yards. Depending on the utility of each part, the process entails recycling, reusing, repairing, or remanufacturing the parts. They may also export the entire vehicle or its components. The leftover vehicle, known as the "hulk" (Mohan et al. 2020), is fed into shredders, where an air classifier sorts the materials, followed by the removal of the ASR (Light). Magnetic separators or non-ferrous metal collectors then separate the irons and non-ferrous metals. The byproducts of these activities are the ASRs (Sakai et al. 2014).

The usable parts are repaired, remanufactured or recycled based on the market demand. At the end of the process, the leftover waste is sent to the car disposal facility to shred the car into pieces (Harun et al. 2021). Generally, the cushions and plastic-based pieces for the dashboards cannot be reused and are disposed of in landfills (Harun et al. 2021). The hulks are baled and taken to a factory that shreds cars into small pieces, where the freed embodied elements are sorted for recycling. Up to 75% of a vehicle's bulk comprises metals, most of which are efficiently and profitably processed to be recycled (Santini et al. 2011).

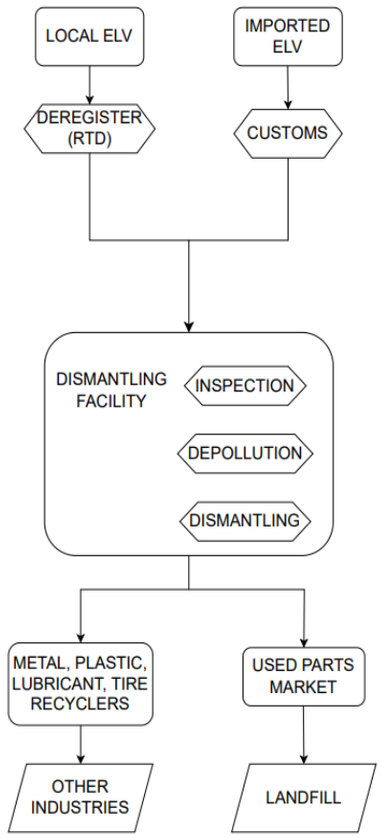


FIGURE 1. Malaysia's current ELV recycling system
*Source* : (Azmi et al. 2013)

Malaysia has established a system for recycling the current ELVs (Figure 1). (Azmi et al. 2013) interviewed Malaysian recycling businesses specialising in recycling ELVs and reselling their parts. The two sources of ELVs in Malaysia are the vehicles from the local market and those imported from abroad. All local automobiles must undergo a deregistration process with RTD before being disposed of. After receiving the notification that the vehicle will no longer be in use, RTD will delete the vehicle's record and the proof of all required tax payments. This procedure prevents it from being used as a weapon or to commit crimes. Malaysia allows the local ELV recycling businesses to import ELVs from other countries with the approval from the Royal Malaysian Customs office. All imported vehicles, including ELVs, must have an import permit (AP).

The businesses in the survey were optimistic that the government would change its stance on ELV. in the future. ELV recyclers typically choose the vehicle they wish to import and use their transportation to do it. The automobiles are delivered to the facility for dismantling. Of the 209 companies registered with the Malaysian Automotive Recyclers Association (MAARA), the largest ELV Recycler of local vehicles is in Perak, Malaysia, and there are 32 dismantling facilities in Johor. The recyclers will review the paperwork for dismantling a vehicle to confirm the car's ownership. Reputable businesses will not dismantle a local ELV if there is no deregistration document from the RTD; however, small-scale dismantlers often ignore this restriction.

The dismantling of imported vehicles is straightforward and only requires customs validation. The businesses compare the engine and chassis numbers with the relevant paperwork. The vehicle undergoes a de-pollution step, and all fluids are drained and stored in appropriate recyclers. It is then dismantled after removing and storing polluting agents such as batteries and mercury. Used spare components are gathered and sold in the open market. Unusable or severely damaged items are categorised by the material they are made of and sold to recyclers in different industries. Any parts that cannot be recycled or sold are disposed of.

The management of ELV recycling is complex and requires diverse approaches to recycling and reusing materials (He et al. 2020). Effective product disassembly is crucial from a strategic standpoint since it can alter a product's behaviour over its entire life cycle, permitting service interventions (maintenance and repairs) and component collection, recycling and reusing at the end of its useful life (Go et al. 2010).

## METHODOLOGY

This study was conducted in Ipoh, Perak and the surrounding areas and involved 200 respondents. This survey consists of five sections containing 47 closed-ended questions, 10 questions related to demographics and three open-ended questions, as shown in Table 1.

Section A contains ten questions on the respondent's background, namely the respondent's age, gender, employment sector, estimated monthly income, duration of stay, educational level, ownership of end-of-life vehicles, number of vehicles owned, number of vehicles owned by age and awareness of the government's efforts regarding ELV. Sections B, C and D use a five-point Likert scale, with 1 strongly disagree, and 5 strongly agree

TABLE 1. Questionnaire section

| Section | Construct | Number of Items |
|---|---|---|
| A | Respondent's Background | 10 |
| B | Knowledge | 10 |
| C | Readiness | 11 |
| D | Attitude | 13 |
| E | Suggestion | 3 |

The data for this study was gathered by distributing the questionnaires to the residents of Ipoh and its surrounding areas between 26 March and 15 May 2023. The questionnaire was distributed using various platforms such as Facebook and WhatsApp. Table 2 provides a summary of the respondents' background.

This study used the Statistical Package for Social Sciences Software (SPSS) to analyse the data and conducted the Correlation Bivariate and descriptive analyses using SPSS.

TABLE 2. Demography of Respondents

| No. | Category | Frequency | Percentage (%) |
|---|---|---|---|
| 1 | Gender | | |
| | Male | 69 | 34.5 |
| | Female | 131 | 65.5 |
| 2 | Age | | |
| | 18 – 20 years | 16 | 8 |
| | 21 – 30 years | 119 | 59.5 |
| | 31 – 40 years | 37 | 18.5 |
| | 41 – 50 years | 18 | 9 |
| | 51 – 60 years | 7 | 3.5 |
| | 61 years and above | 3 | 1.5 |
| 3 | Employment Sector | | |
| | Government | 38 | 19 |
| | Semi Government | 17 | 8.5 |
| | Private | 55 | 27.5 |
| | Self-employed | 20 | 10 |
| | Student | 65 | 32.5 |
| | Unemployed | 5 | 2.5 |
| 4 | Estimated Monthly Income | | |
| | RM 2500 below | 124 | 62 |
| | RM 2501 – RM 3170 | 22 | 11 |
| | RM 3171 – RM 3970 | 12 | 6 |
| | RM 3971 – RM4850 | 11 | 5.5 |
| | RM 4851 – RM 5880 | 9 | 4.5 |
| | RM 5881 – RM 7100 | 7 | 3.5 |
| | RM 7101 – RM 8700 | 5 | 2.5 |
| | RM 8701 – RM 10970 | 6 | 3 |
| | RM 10971 – RM 15040 | 1 | 0.5 |
| | RM 15041 and more | 3 | 1.5 |
| 5 | Educational Status | | |
| | Primary School | 1 | 0.5 |
| | Secondary School | 31 | 15.5 |
| | Diploma | 46 | 23 |
| | Bachelor's Degree and Above | 122 | 61 |
| 6 | Owned of ELV | | |
| | Yes | 86 | 43 |
| | No | 114 | 57 |

## RESULT

This section will discuss the results of the correlation analysis between the three factors, namely knowledge of solid waste and end-of-life vehicles, community readiness and community attitude. The result of the bivariate analysis conducted to examine the relationship between two or more variables showed that each item in each factor was significant, as presented in Table 3. All factors have a significant value of 0.001 (less than 0.005) and correlate with each other, where all items influence the questionnaire. The next step of the data analysis chose one item from each factor based on its Pearson correlation value that showed the most influence. Each factor was correlated with each other to determine the highest Pearson value.

TABLE 3. Correlation between every factor

| | | Knowledge | Readiness | Attitude |
|---|---|---|---|---|
| Knowledge | Pearson Correlation | 1 | 0.699 | 0.624 |
| | Significant | - | 0.001 | 0.001 |
| zzz | N | 200 | 200 | 200 |
| Readiness | Pearson Correlation | 0.699 | 1 | 0.801 |
| | Significant | 0.001 | - | 0.001 |
| | N | 200 | 200 | 200 |
| Attitude | Pearson Correlation | 0.624 | 0.801 | 1 |
| | Significant | 0.001 | 0.001 | - |
| | N | 200 | 200 | 200 |

TABLE 4. Correlation between independent factors

| | Age | Gender | Employment sector | Estimated monthly income | Educational status | Duration of stay | Car ownership |
|---|---|---|---|---|---|---|---|
| Significant | 0.039 | 0.922 | 0.001 | 0.001 | 0.455 | 0.385 | 0.039 |

The correlations between the independent factors in Table 4 were analysed to determine the significance between the items and analyse the items in each factor.

Since the employment sector and estimated monthly income have a significant value of 0.001, these independent factors were correlated using bivariate correlation to determine the significant value and Pearson correlation between them and three items from knowledge, readiness and attitude.

All items in each factor correlate with each other with significant values of 0.001 (less than 0.005). Therefore, the item having the highest correlation Pearson value was selected for analysis with the employment sector and estimated monthly income, and the results are shown in Table 5 and Table 6.

TABLE 5. Correlation between employment sector and each factor

| Employment Sector | | | |
|---|---|---|---|
| | Knowledge | Readiness | Attitude |
| | The process of reuse can reduce unnecessary consumption of new materials | I am willing to be involved in reuse the automotive components program | End-of-life vehicles' policies and related acts should be instantiated to solve the issues of 'bad cars' left stalled everywhere. |
| Pearson Correlation | 0.012 | 0.058 | 0.082 |
| Significant | 0.001 | 0.001 | 0.001 |

TABLE 6. Correlation between estimated monthly income and each factor

| Estimated Monthly Income | | | |
|---|---|---|---|
| | Knowledge | Readiness | Attitude |
| | The process of reuse can promote environmental sustainability | I am willing to be involved in reuse the automotive components program | End- of-life vehicles management makes it easier for owners to dispose off their end-of-life vehicle |
| Pearson Correlation | 0.092 | 0.024 | 0.009 |
| Significant | 0.001 | 0.001 | 0.001 |

Analysis of the relationship between the employment sector and the items in Table 6 showed that the respondents with the most influence are students, where 51% strongly agree with them. The relationship between readiness and the items in the table showed that the respondents with the most influence are students, with 41% strongly agreeing. Similarly, the relationship analysis for attitude revealed that students have the most influence at 41%.

Analysis of the relationship between estimated monthly income and the items in Table 6 revealed that respondents with an income of RM2,500 and below have the most influence, where 77% strongly agreed. The relationship between readiness and estimated monthly income and the items in Table 6 revealed that 88% of the respondents with an income of RM2,500 and below strongly agreed. Concerning attitude, 72% of the respondents with the most influence were those with an income of RM2,500 and below.

In conclusion, based on Tables 5 and 6, the highest Pearson correlation values have the most impact on the result of the questionnaire. The figures in Table 5 show that attitude has the highest Pearson correlation value, indicating that it has the most impact on the questionnaire result. Table 6 shows that knowledge has the highest Pearson correlation value.

## ANALYSIS AND RESEARCH FINDINGS

This section discusses the public's views on implementing the ELV policy in Malaysia and provides recommendations for improving the implementation of the ELV policy. Table 7 presents the results of the descriptive analysis for the challenges each item will face with the implementation of the end-of-life vehicle policy.

TABLE 7. Descriptive analysis

| I support the ideas related to end-of life vehicles | | |
|---|---|---|
| Item | Frequency | Percentage (%) |
| Strongly disagree | 4 | 2 |
| Disagree | 7 | 3.5 |
| Not sure | 52 | 26 |
| Agree | 54 | 27 |
| Strongly agree | 83 | 41.5 |

The results in Table 7 show that most respondents supported the ideas of ELV, where of the 68.5% who were receptive to the idea, 41.5% strongly agreed, 27% agreed, 26% were unsure of the concept of LEV, 3.5% disagreed with the statement, and 2% strongly disagreed with the ideas concerning ELV. In summary, 31.5% of the respondents disagreed with ELV, and 137 of the 200 respondents agreed with the ideas related to ELV.

It is imperative to improve the end-of-life vehicle policy. The authorities responsible for developing this policy in Malaysia could benefit from the recommendations provided by this study. Table 8 presents the descriptive statistics of each item in Section B (knowledge of solid waste management knowledge), Section C (community readiness) and Section D (community attitudes). The 'end-of-life vehicle recycling concept' item in section B requires improvement since the respondents were still unsure about ELV recycling. It is crucial to ensure the community understands the concept of ELV before implementing any policy. The stakeholders must ensure that the information about end-of-life vehicles reaches all users to increase their awareness. One way to disseminate this information is through the mass media because it can spread the message quickly and more efficiently at a low cost. Widespread dissemination of the ELV policy will ensure that the community receive sufficient information concerning the policy.

For section C, the respondents strongly agreed with the item 'I think disposing of end-of-life vehicles in the disposal area is a waste and disturbs the sustainability of the environment', indicating that users did not agree with the disposal of end-of-life vehicles in a particular area because it is wasteful and has a negative impact on the environment. Therefore, the authorities must be more transparent before implementing the ELV policy. They must identify a more suitable area or dispose of the ELV in a closed area. The last section shows that the respondents strongly agreed with the item 'The aesthetic value and love of an old vehicle makes me not want to change to a new vehicle'. Their stance proves that the respondents prefer to hold on and repair their end-of-life vehicle instead of purchasing a new one. The authorities should give more attention to this matter. One way to deal with this issue is by providing incentives or giving returns to those who agree to dispose of their end-of-life vehicles.

TABLE 8. Descriptive statistics for each item

| Component | Item | Mean | Standard Deviation |
|---|---|---|---|
| | Section: Knowledge of Solid Waste Management and End-Of-Life Vehicles Waste | | |
| 1 | I understand the concept of recycling of solid wastes. | 3.925 | 1.056 |
| 2 | The concept of solid waste recycling should be emphasized as an important policy. | 4.190 | 0.999 |
| 3 | I know the concept of End-of-Life Vehicles (ELV) | 3.675 | 1.121 |
| 4 | I know the concept of reuse for end-of-life vehicles. | 3.500 | 1.190 |
| 5 | Solid waste such as car components can be recovered at their end of life. | 3.755 | 1.005 |
| 6 | End of life vehicle components which have been tested to ensure quality and durability can be reused. | 3.905 | 0.965 |
| 7 | The process of reuse can promote environmental sustainability. | 4.250 | 0.878 |
| 8 | The process of reuse can conserve energy. | 4.095 | 0.959 |
| 9 | The process of reuse can reduce unnecessary consumption of new materials | 4.205 | 0.915 |
| 10 | Information about end-of-life vehicle is easier to accessible and understandable | 3.580 | 1.140 |
| | Section: Community Readiness | | |
| 1 | I support the concept of remanufacture of automotive components (End of Life Vehicles). | 3.990 | 1.027 |
| 2 | I will share the ideas of the concept of ELV to my family and friends. | 3.945 | 0.988 |
| 3 | I am willing to be involved in reuse the automotive components program. | 3.840 | 0.985 |
| 4 | Government needs to act out the End-of-Life vehicle components in Malaysia | 4.035 | 1.009 |
| 5 | I think reuse vehicle components more appreciate way to dispose old vehicle | 4.160 | 0.899 |
| 6 | I think the idea sending old vehicles to waste disposal area bad to the environment sustainability | 3.730 | 1.198 |
| 7 | Automotive industry should design the vehicle which the components easy to uninstall/disassemble. | 3.940 | 1.054 |
| 8 | Government should provide a suitable infrastructure for recovery of end-of-life vehicle | 4.195 | 0.928 |
| 9 | The government should provide more incentives for the public involved in recovery activities. | 4.230 | 0.901 |
| 10 | I support the idea of end -of -life vehicle management charges if mandatory | 3.725 | 1.194 |
| 11 | I choose to use the old vehicle rather than the new vehicle because of the bank's debt burden. | 4.115 | 0.983 |

*continue ...*

*.... cont.*

| | | | |
|---|---|---|---|
| | Section: Community Attitude | | |
| 1 | I support the ideas related to end-of life vehicles | 4.025 | 1.000 |
| 2 | I support the ideas related to end-of life vehicles because it reduces vehicle age induced accident | 4.020 | 1.007 |
| 3 | The end-of-life vehicles programmed contribute in sustaining the environment. | 4.075 | 0.945 |
| 4 | In general, the idea of end-of-life vehicles is very good and should serve as a policy in the field of national automotive | 3.995 | 0.985 |
| 5 | End- of-life vehicles management makes it easier for owners to dispose off their end-of-life vehicle | 4.100 | 0.987 |
| 6 | End-of-life vehicles' policies and related acts should be instantiated to solve the issues of 'bad cars' left stalled everywhere. | 4.075 | 0.982 |
| 7 | The idea of end-of-life vehicle management can solve the issues of used car stomping quickly | 4.170 | 0.978 |
| 8 | End-of-life policies and related acts should be instantiated to solve the issues of 'bad cars' left stalled everywhere. | 4.160 | 1.000 |
| 9 | I agree with the introduction of reasonable fees to manage the end-of -life vehicles | 3.860 | 1.148 |
| 10 | This policy will ease the car owners to solve their 'unused car" problems | 4.075 | 0.982 |
| 11 | I think the cost of buying new vehicle is very expensive and choose to use old vehicle | 4.030 | 1.017 |
| 12 | The aesthetic value and affection for the old vehicle make me not want to change to new vehicle | 3.770 | 1.202 |
| 13 | A comprehensive campaign on the end-of-life vehicles' policy from the government side is necessary to raise awareness in the society | 4.110 | 0.981 |

## CONCLUSION

The end-of-life vehicle policy must be scrutinised from various perspectives since the policy will not succeed without transparency on the part of the government. An appropriate ELV policy can ensure a sustainable environment. The key factors in addressing the ELV problem are social acceptance and social awareness. The study results revealed that most respondents do not have a clear understanding of the disposal of end-of-life vehicles and are thus unsure of the consequences of implementing the policy. The government and the industry should develop and implement more ELV reuse programs to enhance public understanding of ELV.

## ACKNOWLEDGEMENT

The authors would like to acknowledge the support of Universiti Kebangsaan Malaysia via grant Project Trans-disciplinary Research Grant Scheme (TRGS), TRGS/1/2020/UKM/02/1/2.

## DECLARATION OF COMPETING INTEREST

None.

## REFERENCES


Abu Kassim, K.A., Abu Husain, N., Ahmad, Y. & Mohd Jawi, Z. 2020. End-of-Life Vehicles (ELVs) in Malaysia: Time for Action to Guarantee Vehicle Safety. *Journal of the Society of Automotive Engineers Malaysia* 4(3): 338–348.

Aishah, N., Ahmad, N., Azizul, M.A. & Sulaiman, S. 2020. Study of End-of-Life Vehicle (ELV) Implementation in Malaysia. *Journal of Industry, Engineering and Innovation* 2(1): 1–7.

Amelia, L., Wahab, D.A., Che Haron, C.H., Muhamad, N. & Azhari, C.H. 2009. Initiating automotive component reuse in Malaysia. *Journal of Cleaner Production* 17(17): 1572–1579.

Azmi, M., Zameri, M., Saman, M. & Sharif, S. 2013. 5 . 6 Proposed framework for End-Of-Life vehicle recycling system implementation in Malaysia: 187–193.

Bhari, B., Yano, J. & Sakai, S. ichi. 2021. Comparison of end-of-life vehicle material flows for reuse, material recycling, and energy recovery between Japan and the European Union. *Journal of Material Cycles and Waste Management* 23(2): 644–663.

Chen, M. 2005. End-of-life vehicle recycling in China: Now and the future. *Jom* 57(10): 20–26.

Go, T.F., Wahab, D.A., Rahman, M.N.A. & Ramli, R. 2010. A design framework for end-of-life vehicles recovery: Optimization of disassembly sequence using genetic algorithms. *American Journal of Environmental Sciences* 6(4): 350–356.

Harun, Z., Muhammad Syahmi Wan Mustafa, W., Abd Wahab, D., Radzi Abu Mansor, M., Saibani, N., Ismail, R., Mohd Ali, H., Azuan Hashim, N. & Maisarah Mohd Paisal, S. 2021. An Analysis of End-of-Life Vehicle Policy Implementation in Malaysia from the Perspectives of Laws and Public Perception. *Jurnal Kejuruteraan* 33(3): 709–718.

He, M., Lin, T., Wu, X., Luo, J. & Peng, Y. 2020. A systematic literature review of reverse logistics of end-of-life vehicles: bibliometric analysis and research trend. *Energies* 13(21).

Kanari, N., Pineau, J.L. & Shallari, S. 2003. End-of-Life Vehicle Recycling in the European Union. *Jom* 55(8): 15–19.

Mamat, T.N.A.R., Saman, M.Z.M. & Sharif, S. 2014. The need of end-of-life vehicles management system in Malaysia. *Advanced Materials Research* 845: 505–509.

Mohamad-Ali, N., Ghazilla, R.A.R., Abdul-Rashid, S.H., Sakundarini, N., Ahmad-Yazid, A. & Stephenie, L. 2018. End-of-life vehicle recovery factors: Malaysian stakeholders' views and future research needs. *Sustainable Development* 26(6): 713–725.

Mohan, T.V.K. & Amit, R.K. 2020. Dismantlers' dilemma in end-of-life vehicle recycling markets: a system dynamics model. *Annals of Operations Research* 290(1–2): 591–619.

Raja Mamat, T.N.A., Mat Saman, M.Z., Sharif, S. & Simic, V. 2016. Key success factors in establishing end-of-life vehicle management system: A primer for Malaysia. *Journal of Cleaner Production* 135: 1289–1297.

Sakai, S. ichi, Yoshida, H., Hiratsuka, J., Vandecasteele, C., Kohlmeyer, R., Rotter, V.S., Passarini, F., Santini, A., Peeler, M., Li, J., Oh, G.J., Chi, N.K., Bastian, L., Moore, S., Kajiwara, N., Takigami, H., Itai, T., Takahashi, S., Tanabe, S., Tomoda, K., Hirakawa, T., Hirai, Y., Asari, M. & Yano, J. 2014. An international comparative study of end-of-life vehicle (ELV) recycling systems. *Journal of Material Cycles and Waste Management* 16(1): 1–20.

Santini, A., Morselli, L., Passarini, F., Vassura, I., Di Carlo, S. & Bonino, F. 2011. End-of-Life Vehicles management: Italian material and energy recovery efficiency. *Waste Management* 31(3): 489–494.

Wong, Y.C., Al-Obaidi, K.M. & Mahyuddin, N. 2018. Recycling of end-of-life vehicles (ELVs) for building products: Concept of processing framework from automotive to construction industries in Malaysia. *Journal of Cleaner Production* 190: 285–302.