Cleaner production and sustainability: stakeholder pressure and the adoption of pollution prevention measures of industrial hazardous waste in Malaysia

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Abstract. In Malaysia, related environment laws to comply is mainly Environmental Quality Act 1974. The Cradle to Cradle concept is practiced, where recycling and recovery are considered useful resources. The scheduled waste recycling companies are mostly located in Selangor, Pulau Pinang and Johor. Majority of the license issued is of the type of electronics waste. Regulated industries are expected to implement the environmental safety and health management programme to maintain their competitive edge. Hazard control actions are such as scheduled waste control and emission control. Safety management programmes must be integrated into the company daily activities. Workplace hazard is mandatory to be communicated to those who work with the risk. The employees must be trained to handle hazardous waste. Companies have to prepare emergency and crisis management against potential hazardous waste emergencies. Consequently, the benefits gained through improvement with technological investment offset are the main drivers for environmental management programme. In other words, this programme can improve the environmental aspects and performance using industrial engineering, improve natural resource efficiency, reduce energy costs as well as the costs of handling and disposing of hazardous waste, reuse alternative materials and reduce release of pollutants by recycling of waste. This study looks into the quantity of hazardous waste generated, as well as DOE court cases. The study shows the increasing trend of environmental protection expenditure especially on waste management, even though the chemical industry is generating lesser scheduled waste. DOE court cases are mainly related to licensing and water pollution. Many companies engage the services of scheduled waste facilities are located in Selangor, Johor and Pulau Pinang, though Cenviro operates the first integrated hazardous waste management centre in Malaysia. With the positive relationship between environmental performance and environmental care, the higher level of environmental performance achieved, the better will become the environmental quality. Environment performance of the manufacturing sector could be further improved by promoting environmental management programmes.

Keywords. Environmental Aspect, Environmental Management Programme, Environmental Performance, Hazardous Waste, Pollution Prevention, Scheduled Waste, Stakeholder, Sustainability.
1. Introduction
Malaysia is one of the twelve mega biodiversity countries in the world. However, the environmental performance of the country has worsened in last two years. Malaysia ranks 63rd in 2016 compared to 51st in 2014 in Environmental Performance Index (EPI) [20]. In comparison, neighbouring country such as Philippines has improved 48 ranks in the same period [24].

Zero waste programmes have been implemented in many countries though without any holistic zero waste strategy [27], as studies such as Masoumik, Abdul-Rashid and Olugu [21] suggests that a clean technology strategy is important in generating competitive benefits. Furthermore, Yu, et al. [25] urges that companies should consider together internal green supply chain management and with customers as well as suppliers when practising environmental sustainability in order to improve operational performance. Furthermore, companies can identify opportunities for improving their sustainability performances through sustainable supplier evaluation [14]. Through the pressure from the customers, companies seek to be international standards certified in meeting customers’ requirements.

The export-oriented manufacturing leads the sector to the global market as well as the requirements of standardisation. Refer to Table I. The highest growth rate is at the OHSAS 18001 certification in the past decade [7].

### Table 1. Certification of International Standards by Organisation

| Management System                                      | 2009  | 2018  | Growth Rate |
|--------------------------------------------------------|-------|-------|-------------|
| ISO 9001 QMS                                           | 4,591 | 7,975 | 21%         |
| ISO 14001 EMS                                          | 734   | 1,338 | 182%        |
| OHSAS 18001 OSH (OHSAS 18001 & MS 1722 Part 1)          | 344   | 1,201 | 349%        |

*Source: Department of Statistics Malaysia (DOSM)*

However, ISO 14001 and OHSAS 18001 are given relatively higher priority by some industries. In 2018, from the number of certification, QMS and OHSAS are emphasized especially by the Construction Sector while EMS is emphasized by the Electrical and Electronics Sector [7].

### Table 2. Certification of International Standards (Selected Industry)

| INDUSTRY                              | ISO 9001 (2009) | ISO 9001 (2018) | ISO 14001 (2009) | ISO 14001 (2018) | OHSAS 18001 (2009) | OHSAS 18001 (2018) |
|---------------------------------------|-----------------|-----------------|------------------|------------------|--------------------|--------------------|
| Food products, beverage and tobacco  | 227             | 304             | 93               | 143              | 91                 | 173                |
| Concrete, cement, lime, plaster       | 120             | 168             | 11               | 32               | 13                 | 27                 |
| Construction                          | 671             | 1,425           | 25               | 103              | 33                 | 227                |
| Transport, storage and communication  | 159             | 275             | 9                | 52               | 17                 | 68                 |
| Engineering services                  | 259             | 718             | 13               | 102              | 19                 | 150                |
| Coke & Refined Petroleum Products     | 19              | 21              | 8                | 12               | 3                  | 6                  |
| Rubber & Plastic Products             | 341             | 491             | 82               | 154              | 11                 | 38                 |
| Metals Products                       | 394             | 820             | 71               | 164              | 23                 | 72                 |
| Electrical & Optical Products         | 325             | 439             | 150              | 193              | 38                 | 92                 |
The regulated industries implement the EHSMS to maintain their global competitive edge [2]. On the other hand, environmental issues have become growing critical concerns of businesses. In addition, as the public grow higher conscious on environment. Malaysia has enacted the Environmental Quality Act 1974 and relevant regulations. For Environmental Quality (Scheduled Waste) Regulations 2005 in specific, Regulation 6 permits waste generator to manage their scheduled wastes in a sustainable way by turning their scheduled waste into energy or other useful materials for other interested parties. Waste management practices are linked with pursuit of resource efficiency and emissions reduction to save cost [1]. According to 2017 statistic published by Department of Environment (DOE) Malaysia, from total 226,748 MT of SW204 generated by various industries, 30,516 MT (7.43%) of it has obtained approval from DOE under Regulations 6 to be reused as raw materials.

As stipulated under Clause 6.1.1 of environmental management system international standard, an organization shall determine the environmental aspects and their associated environmental impacts. Such requirement is intended to reduce the generation of waste using cradle to cradle approach. Environmental management system (EMS) and the resultant performance improvements are becoming important purchasing criteria. Hence, it is essential that the enterprises deliver reasonably priced environmentally friendly produced high quality goods and services timely. According to Porter and van der Linde (1995) innovations could be trigger properly designed environmental standards that improve values, ultimately enhanced resource productivity that makes companies more competitive [22]. Throughout the Product Life Cycle (PLC), the industry has environment impacts and it must deal with. The industry is one of the targeted sectors in the Malaysian Industrial Energy Efficiency Improvement Project.

With introduction of the laws, there comes enforcement. Environmental violations commonly found in Malaysia are related to licensing. In the Court, 104 cases were registered 2017 after recorded decline of cases in the last 5 years [8]. In 2017, the number of licensing cases exceeded other types totaling 39 (38%), followed by 29 (28%) for water pollution [8].

In order to comply with the environmental laws, companies have to set aside budget to spend on environmental protection. The Environmental Protection Expenditure (EPE) has increased from RM2.11 billion in 2010 to RM2.55 billion in 2015 [9]. Further details show that operating expenditure has been dominates (68.5%) the Environmental Protection Expenditure, meaning that capital investment on environmental protection (31.5%) is less emphasised. The Manufacturing sector was the highest contributor for EPE at RM1.62 billion in 2014 and RM 1.88 Billion in 2015. In addition, waste management recorded growth of EPE from RM642.8 Million (28.6%) in 2014 to RM754.8 Million (29.6%) in 2015 [9]. This indicates the importance of the manufacturing sector in environmental protection especially on waste management. Hu and Hsu (2010) suggested that sustainable waste management has been practised by many of Taiwan Electrical and Electronic (E&E) manufacturing sector [18].

Environmental stewardship practices are found to be implemented at a medium level. Economically, sustainable manufacturing in Malaysia is implemented, while the social wellbeing aspect of sustainable manufacturing has been practiced at a large extent [17]. Reverse logistics was found to have significant positive effect on cost reduction [10]. Hameed et al. [15] found a significant relationship between sustainable environmental manufacturing practice and environmental performance. Environment performance of the manufacturing sector is negatively associated with company financial performance [23]. Goh and Wahid [13] show that ISO 14001 implementation has positively impacted company performance. The organizational performance values for certified companies are higher than those without the certification [16]. Goh, et al. [12] shows that certification affects positively on the environmental and economic outcomes. Eltayeb and Zailani [11] argue that green purchasing is caused by regulations, customer pressures, and expected business benefits. Green innovation initiatives are affected by environmental regulations, market demand, and firm initiatives

| Recycling | 12 | 30 | 22 | 25 | 5 | 13 |
|-----------|----|----|----|----|---|----|

*Source: Department of Statistics Malaysia (DOSM)*
[26]. Aziz et al. [3] indicate that the adoption of green initiatives and the resulting environmental performance is still moderate. ISO 14001 is an international standard for an organisation to reduce its environmental impacts. Adopting the requirements of the environmental management system is on a voluntary basis requires resources and investments. Despite, EMS certification is still increasing in the industry where the driving factors behind this are still remain unclear.

The objective of this study is to evaluate the overall management systems implementation and the driving factors of the adoption of pollution prevention measures among scheduled wastes companies. Conclusions will be drawn based on correlation of information such as number of manufacturing companies establishment, scheduled wastes inventory, EMS certification status among scheduled wastes companies, scheduled wastes companies profile, environmental protection expenditure and legal requirements on scheduled wastes management.

2. Methods
The purpose of this study is to ascertain the status of management systems implementation in scheduled waste companies. Data were derived from secondary data resources such as annual reports, environmental reports, sustainable development reports and corporate websites. The study assesses implementation of the certification on how the certification affects its operations and processes.

3. Results and Discussion
In Malaysia licensed schedule waste facilities started to thrive following the Basel Convention. Recycling has the function of bringing economical alternatives to landfill disposal. According to the Environment Quality Report 2017 [5], a total of 2,017,280.76 metric tonnes of scheduled wastes were generated. The quantities of electronics waste (e-waste) decreased slightly to 28,604 Metric Tonnes in 2017. The quantities of e-waste generated according to the DOE's Environment Quality Report has increased from 40,280 Metric Tonnes in 2006 to its peak at 163,340 Metric Tonnes in 2010 and reduced to 152,720 Metric Tonnes in 2011 [19]. The manufacturing sector in Malaysia was the first identified generators of scheduled waste. A total of 223,897.54 metric tonnes of scheduled wastes were generated by the Electric and Electronic Industries, representing an increase of 23.19% as compared to 181,754.50 metric tonnes reported in 2011. In contrast, a total of 276,242.51 metric tonnes of scheduled wastes were generated by the Chemical Industry in 2017, representing a decrease of 38.05% as compared to 445,915.82 metric tonnes reported in 2011 [4]. Most of the Department of Environment Licensed Scheduled Waste Facilities (Prescribed Premise) are located in Selangor, Johor and Pulau Pinang. Until October 2018, 689 licences were issued, of which 141 licenses are for e-waste [6].

Note that Cenviro Sdn Bhd, an integrated waste management company owned by Khazanah Nasional Bhd, is a big player in the industry. Cenviro is licensed to handle 76 categories of scheduled wastes — there are 77 in total — listed under the Environmental Quality (Scheduled Wastes) Regulations 2005. According to Cenviro’s website, it owns and operates Malaysia’s first integrated hazardous waste management centre has been in operation since 1998. Other major scheduled waste vendors are such as 5E Resources, Chemalaya and Lafarge Cement Industries / Geocycle Environmental Services in Johor, Century Surf, Kimia Zue Huat, Ming Engineering Plastic, Preference Lifecycle Resources, Reclaintek and Shan Poornam Global in Pulau Pinang, Amita Kub-Berjaya Kitar, Chemindus, Jaring Metal Industries, Pentas Flora and Tex Cycle in Selangor [6]. The study assesses implementation of the certification on how the certification affects its operations, operational control and Emergency Preparedness and Response, and Communication, Participation and Consultation.

The policy is a statement of a company’s commitments to its overall environmental safety performance. In order to secure workers’ safety, safe working practices have been included in the company activities. Establishment of Standard Operating Procedures (SOP), training and hazard communication are crucial to those who work with the risk. The scheduled wastes handler must be
trained on the SOP and their competency level shall be evaluated. These companies have to identify emergencies and ready with emergency response action plans.

Within the companies, safety committees are established for worker participation, communication and consultation. For the public, the companies disclose information and organize corporate social responsibility activities.

4. Conclusions
Scheduled wastes generated have been reducing in the chemical industry in contrast to other industries such as E&E. Scheduled waste recovery helps to reduce impact of the waste to the environment as well as be an alternative source for industry. Many scheduled waste facilities are located in Selangor, Johor and Pulau Pinang though Cenviro operates the first integrated hazardous waste management centre in Malaysia. Main recyclers are more concern about environment and safety where ESHMS certification is obtained. On EPE, operating expenditure has been dominating while waste management is of growing importance. The latest focus of DOE enforcement through court prosecution is on licensing and water pollution. ESH programme helps to link better partnership between government, local citizens and companies. Regulated industries are expected to adopt EHSMS to maintain their competitiveness. In addition, this extends the coverage of the systems to embrace the entire value chain, which also corresponds to Corporate Social Responsibility. The finding is expected to be informative for future research especially as an indicator for the development of a suitable EMS framework for other manufacturing sectors in Malaysia. In addition, this could also serve as reference for investors who are currently generating or about to generate scheduled wastes, that there are alternate ways to manage their scheduled waste in an sustainable and cost-effective way through waste recovery and reuse.

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