# ENVIRONMENTAL LEGISLATION AWARENESS AMONG CONSTRUCTION CONTRACTORS IN MALAYSIA

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**ABSTRACT**

*Waste is mostly contributed by the construction industry. There is growing importance in the strategies to minimise waste at construction sites. This study aimed to determine the level of awareness on environmental legislations among construction players in Malaysia. from October 2015 to March 2016, questionnaires were distributed to 306 Malaysian contractors who were engaged in various types of construction projects in Malaysia. The findings found that the level of awareness on environmental legislations among the respondents was quite moderate, which was possibly explained by the coercive and normative isomorphism tenets. Several insights for further work are provided in this paper.*

**Keywords:** waste minimization; construction; waste; environmental; legislation; isomorphism

## INTRODUCTION

In the construction industry, waste is defined as unwanted or discarded material. Waste is continually causing environmental and global warming problems in the world. According to Mohd-Nasir, Yusoff, Sulaiman and Rakmi (1998), the construction industry in Malaysia is progressing and this helps to boost the country's economy. However, this blooming industry is acknowledged as one of the single largest waste streams and major contributors to the natural resources consumption and waste production. As a developing country, Malaysia realizes that the construction industry plays a significant role in its economic growth. Over the last 20 years, the industry consistently contributed between 3% and 5% of the national GDP (Construction Industry Development Board (CIDB), 2000).

One of the factors that affects waste management in the construction industry of Malaysia is the contractors' attitudes and behaviors regarding waste management, which depends on the size and category of the contractors (Begum, Siwai, Pereira & Jaafar, 2009). A contractor is an organisation or individual who directly employs or engages construction workers, or as part of its/his business, it/he carries out, manages or controls construction work (e.g. building, altering, maintaining or demolishing). Some examples of contractors are sub-contractors, any individuals, sole traders or self-employed workers.

There is an increasing pressure throughout all stages in the construction industry to strategize waste minimization by implementing useful working practices (Ikau, Tawie & Joseph, 2013). Sustainable waste management on sites continues to be a low priority for most contractors despite the introduction of a number of government policy initiatives to address this issue (Begum *et al.*, 2009). The environmental performance of built environment can be enhanced by implementing waste minimization strategies. Waste minimization is one of the initiatives in advancing sustainability agenda in the country. For example, it is included as one of the policy goals in both Eighth and Ninth Malaysia Plans (Zainul-Abidin, 2010). For this reason, Malaysian construction players should improve their attitude on sustainability and sustainable construction (Zainul-Abidin, 2009). The increasing generation of waste accompanied by the problems of disposal is gaining momentum in Malaysia in tandem with the increasing demand of infrastructure and residential development projects (Begum, Satari & Pereira, 2010). The Borneo Post (2013) reported that 33,000 tons of solid waste were generated daily in Malaysia in the year 2012. Meanwhile, in 2010, the government of Malaysia spent RM1, 136.00 million on waste management. Out of this total, the expenditure on non-hazardous solid waste stood at RM920.50 million (81.0%), while scheduled waste stood at RM215.60 million (19.0%) (Department of Statistics Malaysia, 2011). These conditions may give a huge impact to project costs and time due to the physical and non-physical waste for Malaysian construction industry (Nagapan, Rahman & Asmi, 2012).

In different parts of Malaysia, large amounts of construction waste have been created due to the significant improvement of construction relating to activities in this country, which significantly impacts the environment and causes increased public concern among local communities. On the same note, unlawful dumping has been increasing significantly during recent years in Malaysia (Yahaya & Larsen, 2008; Rahmat & Ibrahim, 2007; Faridah, Hasmanie & Hasnain, 2004). The majority of contractors neither practice source separation, source reduction, reuse or recycle at construction sites, nor do they dispose their waste at the landfills. Therefore, this research paper attempted to promote the importance of sustainable waste control practices.

One of the institutional efforts in promoting sustainable development agenda in Malaysia is the establishment of an agency called the Construction Industry Development Board (CIDB). The agency's main objective is to transform the industry by improving its environmental performance. CIDB has reinforced the industry's commitment to sustainable development and an environmentally responsible industry in the "Construction Industry Master Plan" (Construction Industry Development Board, 2007). CIDB plays a role to educate the industry's key players via a series of training courses, workshops and awareness raising events in support of the national policy. Nevertheless, the Malaysian industry players still lack the knowledge on sustainable construction based on the feedback from the programs held by CIDB (Ismail, Idris & Mat-Nasir, 2012a).

Another initiative is the establishment of National Green Technology Policy, which was launched in 2009. This policy indicates that green practice is used as the basis for the Malaysian government to steer sustainable construction. In addition, the policy also demonstrates that the government is committed to executing problem solving efforts on all related green issues in the country, which complements the global vision on sustainable development (i.e. economy, social, environment and quality of life). Unquestionably, policy plays a vital role in promoting sustainable construction (Ismail *et al.*, 2012a).

In Malaysia, a number of policies and legislations on environmental management and waste has been introduced, namely, the Solid Waste and Public Cleansing Management Act 2007 (PPSPPA), Standard Specifications for Building Works (SBW), Environmental Quality Act 1974 (EQA), Pembinaan Malaysia Act 1994 (PMA), the Environmental Quality (Scheduled Wastes) Regulations in 2005, the Master Plan on National Waste Minimization (MWM) in 2006, and the National Solid Waste Management Policy in 2006. The Construction Industry Development Board (CIDB) plays an important role in minimizing the waste issue in Malaysia as stipulated in the Act 520, Pembinaan Malaysia Act (1994). There are 10 parts prescribed under this act, namely: Preliminary, The Lembaga, Chairman, officer and servants, Finance, Other powers or The Lembaga, Registration of Contractors, Accreditation and Certification, Levy, Enforcement and Investigation, and General Part. Part I and Part IX are related to construction waste issues. Part 1 describes construction works, whilst Part IX is geared more towards enforcement and investigation. The act lists 1) functions relating to the construction works in the country; 2) power to investigation officers for entering construction sites at any time to do their inspection; 3) authority to act upon construction waste left at the site throughout the duration of site clearance.

Act 127, Environmental Quality Act (1974) is under the authority of the Ministry of Natural Resources and Environment. The act scopes are to prevent, reduce,

and control pollution, as well as to enhance the environment. The wastes appearing in this act are more related to general environmental problems.

The wastes are interpreted as liquid, solid, gasses and radioactive. These wastes are either normal waste or scheduled waste (Mustafa, 2011; Sasitharan et al., 2012). In Malaysia, the acts are drafted in a more general manner, thus they are bound to be similarities in the clauses across the acts enacted by various government and private agencies (Wahi, Joseph, Tawie & Ikau, 2016).

It is the responsibility of construction industry players to comply with all these institutional laws and legislations, especially those concerning protection and conservation of environment. One of the critical success factors in implementing sustainable construction in developed countries is via strict enforcement through laws and legislations (Ismail, Idris & Mat-Nasir, 2012b). A finding from the survey that was conducted among developers also indicates that awareness on sustainable construction is important in order to further implement sustainable construction in Malaysia (Idris, Ismail & Hashim, 2015). Past studies had focused on determining the level of knowledge or awareness on sustainable construction concept but not on the environmental awareness issues (Zainul-Abidin, 2010; Zainul-Abidin, 2009). However, in this paper, it is maintained that awareness on sustainable construction includes the awareness on laws and legislations relating to environmental protection and waste management. For this reason, this study aimed to determine the level of awareness on institutional and environmental law awareness among construction players particularly on the Environmental Quality (Scheduled Waste) Regulations in 2005 and Environmental Quality Act 1974 (EQA). This is due to the reason that both laws cover the procedures and regulations on waste management, which are relevant at construction sites.

## LITERATURE REVIEW

Sustainability is a principle that has been adopted in the construction industry to minimize adverse impacts whilst maximizing positive impacts to achieve a balance in economic, social and environmental performances. However, sustainability is still not fully accepted by construction players in Malaysia. Despite various measures taken by the government and private sectors to create awareness on environmental protection and preservation at construction projects, there is a lack of awareness on sustainable construction from the developers. The study by Ismail *et al.* (2012b) revealed that overall, the level of awareness on sustainable construction is still below average. This is due to the lack of monitoring and enforcement through laws and legislations in Malaysia. Similarly, in the local context, studies examining the level of awareness of sustainability practice awareness on environmental issues amongst Malaysians are relatively scarce due to the lack of exposure on environmental issues (Omardin, Zainul & Wan Ali, 2015).

A study by Elmualim and Alp (2016) found that current regulations are not enforcing and there is not much being articulated and implemented to advance sustainable construction in developing countries. This is mainly due to low public awareness on sustainable construction. Mahayuddin, Pereira, Badaruzzaman and Mokhtar (2008) indicated that regulations for the disposal of construction waste in Ipoh have not been as stringent as those for municipal solid waste. Another issue that needs to be considered to improve the management of construction waste disposal is the awareness and attitude of the communities involved in the construction sector, such as the construction industry, local authority, and local people. Negative attitude towards subordinates, attitudinal differences between different working groups, and lack of training to reinforce the importance of waste minimization practice have obstructed proper waste management practice in the industry (Kulatunga, Amaratunga & Haigh, 2006).

In addition, the factors that will steer sustainable movement are awareness and knowledge. To encourage people or organizations to be involved in sustainable development activities, their personal values on sustainability must be nurtured. It is expected that developers would have some knowledge about sustainable construction concept, and they have begun incorporating it in their projects as there have been various initiatives undertaken by the government and professional bodies to increase the awareness and knowledge on this concept among developers (Zainul-Abidin, 2010). Zainul-Abidin (2010) carried out a field study to investigate Malaysian developers' present knowledge and understanding regarding the concept of sustainable construction, as well as their attitudes towards it. The findings revealed that many developers were still ignorant about the importance of sustainability practice and did not have the urgency to adopt this practice.

Earlier, Zainul-Abidin (2009) examined the level of awareness among project developers with regard to the sustainability concept in Malaysia. It was found that the respondents considered themselves to have moderate or good knowledge on sustainable concept (the mean level was 3.43 out of 5). One of the reasons that contributed to the overall results was the lack of enforcement. Many respondents emphasized the need for enforcement through laws and legislations. Zainul-Abidin (2009) asserted that although there are several acts which focus on environment, such as the Environment Protection Act, "due to lack of monitoring and enforcement, people just do not really care about it."

Several developed countries, such as Japan and Hong Kong, have successfully instigated environmental legislations. Japan manages its construction waste in a sustainable manner. Recycling Law was implemented by the Japanese government in 1991. The Law empowers the selection of materials for recycle and reuse by the Minister (Rao, Kumar, Jha & Misra, 2007). Meanwhile, Construction

Waste Disposal Charging Scheme (CWDCS) was introduced by the Hong Kong government in December 2005 (Hao, Hills & Tam, 2008).

Generally, attitude is a positive and negative feeling towards specific objects, whereby it exerts an influence on behavior. There is a lack of knowledge among the general public as well as social norms that adversely affects waste practice. In Malaysia, there has been no widely published research that describes contractors' attitudes and behaviors towards waste management (Begum *et al.*, 2009), particularly on environmental legislations, which provided the motivation for this study.

## THEREOTICAL BACKGROUND

Institutional theory was employed in this study to comprehend individual practices and activities (Joseph *et al.*, 2016). In this paper, the term "individual practices" refers to the level of awareness on environmental legislations. It is postulated that the level of awareness is associated with the compliance with environmental legislations. DiMaggio and Powell (1983) described 'isomorphism' as a 'homogenization of organizations' through a process that forces one unit to conform to other units in the population that deals with similar situations. There are three types of isomorphic pressures: coercive, mimetic and normative. In this quantitative research, only coercive and normative isomorphism are discussed. This is in line with Joseph and Taplin (2012), who argued that mimetic isomorphism is more relevant in qualitative studies.

The most cited type of institutional force is coercive isomorphism According to DiMaggio and Powell (1983), pressures can be "exerted by other organizations on which an organization may be dependent, as well as cultural expectations in which the organizations operate". In this paper, the potential coercive factors are formal and informal rules related to the enforcement from relevant authorities that potentially explain the contractors' level of knowledge on environment legislations, which, in turn, improve the compliance with environmental legislations. This relates to the legitimacy concept. For an organization to gain legitimacy and survive, it should comply with the prevailing rules and regulations in its industry (DiMaggio & Powell, 1983).

The second isomorphism category is normative isomorphism. Professional and occupational groups usually create this element of pressure (Rahaman, Lawrence & Roper, 2004). DiMaggio and Powell (1983) argued that, the extent to which the organization becomes similar to other organizations in the same field is developed via academic qualifications and networking as a result of participation in professional and trade associations. This study intended to determine whether

the shared values related to the knowledge on environmental legislations are disseminated via seminars and professional body in the construction industry.

## METHODOLOGY

A quantitative study was carried out to investigate the level of awareness on institutional and environmental laws among the construction players. Questionnaire was developed and distributed to the contractors from different companies, which are currently involved in various on-going construction projects for public or private use. The list of contractors was obtained from the Construction Industry Board (CIDB) directory (www.cidb.gov.my). Data were collected through questionnaires between October 2015 and March 2016. The questionnaire distribution was done using two approaches, namely, via e-mail and direct visits to the respective contractors' sites. A total of 500 respondents were approached and 306 (61%) questionnaires were returned for analysis. The data gathered were tabulated and analyzed quantitatively using the Statistical Packages for Social Sciences (SPSS). Descriptive analysis was used to calculate the percentages and averages. Following Zainul-Abidin (2010) in determining the level of understanding on sustainable concept, this paper categorized the level of awareness (measured in mean of all responses) on environmental legislations as shown below in Table 1.

**Table 1**: Level of Awareness Used in the Questionnaire

| Category | Score |
|---|---|
| Very poor | 0 to 20% |
| Low | 21% - 40% |
| Moderate | 41% - 60% |
| Good | 61% - 80% |
| Excellent | 81% - 100% |

The questionnaire comprised of three sections: i) Section A (demographic profile of the respondents), ii) Section B (level of awareness on the Environmental Quality Scheduled Wastes Regulations 2005 – using 'yes' or 'no), and iii) Section C (level of awareness on Environmental Quality Act 1974 – using 'yes' or 'no). The Environmental Quality Scheduled Wastes Regulations 2005 consists of 45 items and 14 regulations as follows:

- Regulation 3. Notification of the generation of scheduled wastes
- Regulation 4. Disposal of scheduled wastes
- Regulation 5. Treatment of scheduled wastes
- Regulation 6. Recovery of material or product from scheduled wastes
- Regulation 7. Application for special management of scheduled wastes
- Regulation 8. Responsibility of waste generators
- Regulation 9. Storage of scheduled wastes
- Regulation 10. Labeling of scheduled wastes
- Regulation 11. Waste generators shall keep an inventory of scheduled wastes
- Regulation 12. Information to be provided by waste generators, contractors and occupiers of prescribed premises
- Regulation 13. Scheduled wastes transported outside waste generators' premises to be accompanied by information
- Regulation 14. Spill or accidental discharge
- Regulation 15. Conduct of training
- Regulation 16. Compounding of offences

Meanwhile, the Environmental Quality Act 1974 consists of 16 items. The next section explains the results of the study.

## RESULTS

Table 2 shows the backgrounds of the respondents. It was found that the majority of the respondents were from the executive level (71.24%), followed by the sub-executive level (13.40%), and the lowest group was from the general labor (2.61%). Based on Table 1, it can be seen that the executive level played a major influence in this research. In the company category, 21.9% of the construction companies were Class A (Grade 7) licensed contractors. The majority of the respondents (51.3%) worked for public limited companies. Most of the participating companies were incorporated in 1990's (96.73%). In addition, 72.5% of the respondents comprised *Bumiputera* companies, while 68.3% of the companies were accredited to ISO 14001 or equivalent. Most of the respondents had a degree (66.3%) and 29.4% of the respondents had 16 to 20 years' of experiences in the construction industry. The majority of the respondents were Malay, and most of their construction projects were residential and private projects. Private construction projects are those owned by private persons, whereas public construction projects are owned by the federal government.

Figure 1 shows the level of awareness on Environmental Quality Scheduled Wastes Regulations 2005. The detailed results of the awareness on environmental institutional laws and regulations in the construction industry are included in the Appendix.

**Table 2:** Demographic Information of the Respondents

| Details | Frequency | % |
|---|---|---|
| **Position in the company** | | |
| Managerial Level | 39 | 12.75 |
| Executive Level | 218 | 71.24 |
| Sub-Executive | 41 | 13.40 |
| General Labor | 8 | 2.61 |
| **Total** | **306** | **100.0** |
| **Company category** | | |
| Class A (Grade 7) | 67 | 21.9 |
| Class B (Grade 6) | 30 | 9.8 |
| Class C (Grade 5) | 56 | 18.3 |
| Class D (Grade 4) | 48 | 15.7 |
| Class E (Grade 3) | 44 | 14.4 |
| Class F (Grade 2) | 27 | 8.8 |
| Class G (Grade 1) | 34 | 11.1 |
| **Total** | **306** | **100.0** |
| **Type of business organization** | | |
| Public company | 50 | 16.3 |
| Public limited company (Sdn Bhd) | 157 | 51.3 |
| Partnership | 83 | 27.1 |
| Sole proprietorship | 16 | 5.3 |
| **Total** | **306** | **100.0** |
| **ISO 14001** | | |
| Yes | 209 | 68.3 |
| No | 97 | 31.7 |
| **Total** | **306** | **100.0** |
| **Highest education level** | | |
| Post Graduate | 56 | 18.3 |
| Degree | 203 | 66.3 |
| Diploma | 42 | 13.7 |
| Certificate | 5 | 1.7 |
| Other | 0 | 0.0 |
| **Total** | **306** | **100.0** |
| **Experience in construction industry** | | |
| More than 25 years | 60 | 19.6 |
| 21-25 years | 56 | 18.3 |
| 16-20 years | 90 | 29.4 |
| 11-15 years | 46 | 15.0 |
| 6-10 years | 43 | 14.1 |
| Less than five years | 11 | 3.6 |
| **Total** | **306** | **100.0** |

| Details | Frequency | % |
|---|---|---|
| **Year of incorporation** | | |
| 1800's | 6 | 1.96 |
| 1900 – 1949 | 13 | 4.25 |
| 1950 – 1999 | 283 | 92.48 |
| 2000's | 4 | 1.31 |
| **Total** | **306** | **100.0** |
| **Status of company** | | |
| Bumiputera | 222 | 72.5 |
| Non-Bumiputera | 84 | 27.5 |
| **Total** | **306** | **100.0** |
| **Location of company** | | |
| Mid Zone: Selangor, Perak | 56 | 18.3 |
| Northern: Perlis, Kedah, Pulau Pinang | 37 | 12.1 |
| East: Terengganu, Kelantan, Pahang | 30 | 9.8 |
| Southern: Melaka, Negeri Sembilan, Johor | 32 | 10.4 |
| Sabah | 34 | 11.1 |
| Sarawak | 59 | 19.3 |
| Wilayah Persekutuan | 58 | 19.0 |
| **Total** | **306** | **100.0** |
| **Ethnicity** | | |
| Malay | 183 | 59.8 |
| Chinese | 58 | 18.9 |
| Iban | 33 | 10.8 |
| Other | 32 | 10.5 |
| **Total** | **306** | **100.0** |
| **Type of construction project** | | |
| Private | 64 | 20.9 |
| Residential | 136 | 44.4 |
| Commercial | 51 | 16.7 |
| School | 25 | 8.2 |
| Infrastructure | 28 | 9.2 |
| Other | 2 | 0.7 |
| **Total** | **306** | **100.0** |

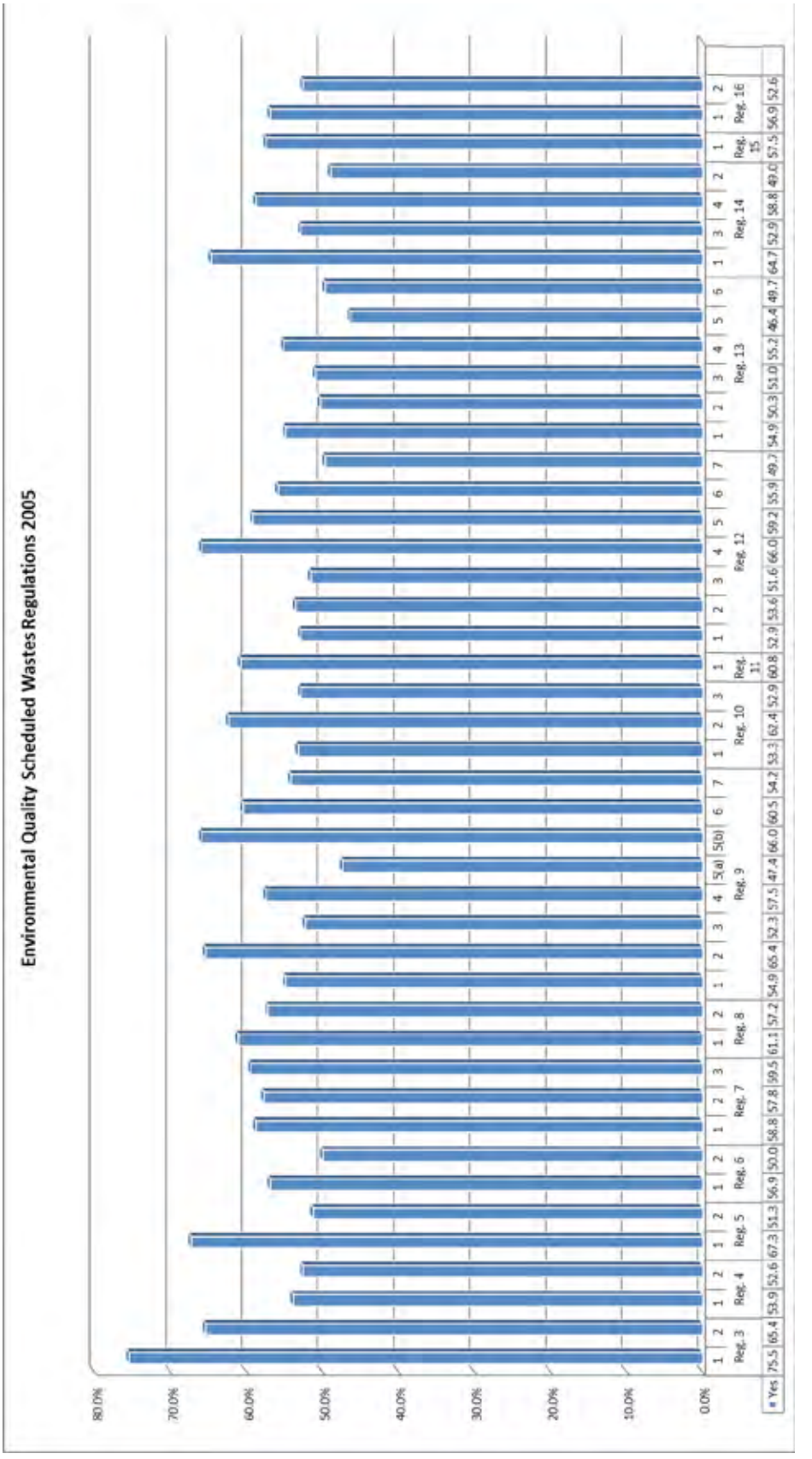


**Figure 1:** Awareness on Environmental Quality Scheduled Wastes Regulations 2005

More than 50% of the respondents were aware of 41 items (out of 45 items) in the Environmental Quality Scheduled Wastes Regulations 2005. This indicates that the level of awareness was moderate (56.4%), as measured by mean. Meanwhile, less than 50% of the respondents were not aware of the following five tems:

- Any person may store scheduled wastes generated by him for 180 days or less after his generation provided that— (a) the quantity of scheduled wastes accumulated on site shall not exceed 20 metric tons.
- The waste generator, contractor or occupier of the prescribed premises shall each keep a signed copy of the Sixth Schedule which shall be retained as a record for at least three years from the date the scheduled wastes are received by the occupier of the prescribed premises.
- The contractor shall ensure that all his employees that are involved in the handling, transportation and storage of scheduled wastes attend training programs.
- The contractor shall ensure that during the training program, each employee is well informed of the purpose and use of the Seventh Schedule.

The contractor shall undertake studies to determine the impact of spillage or accidental discharge on the environment over a period of time to be determined by the Director General.

Table 3 shows the level of awareness on Environmental Quality Act 1974. More than 50% of the respondents were aware of 10 items (out of 16 items) in the act. The level of awareness was quite moderate (measured in mean), which was 51.4 %. Less than 50% of the respondents were not aware of the following six items:

- Do you cause or permit the discharge of odors which by virtue of their nature, concentration, volume or extent are obnoxious or offensive?
- Do you pollute or cause or permit to pollute any soil or surface of any land in contravention of the acceptable condition?
- Do you emit, discharge or deposit any wastes into any inland waters in contravention of the acceptable condition?
- Do you place any waste in or on any waters or in a place where it may gain access to any waters?
- Do you cause the temperature of the receiving waters to be raised or lowered by more than the prescribed limits?
- Do you discharge or spill any oil or mixture containing oil into the Malaysian waters in contravention of the acceptable condition?

**Table 3:** Awareness on Environmental Quality Act 1974

| Item | Key Legal Provisions | Awareness (%) | |
|---|---|---|---|
| | | Yes | No |
| (1) | Do you place any matter in a location where it may be released into the atmosphere? | 52.6 | 47.4 |
| (2) | Do you cause or permit the discharge of odors which by virtue of their nature, concentration, volume or extent are obnoxious or offensive? | 45.1 | 54.9 |
| (3) | Do you burn any wastes of the trade, process or industry? | 54.6 | 45.4 |
| (4) | Do you use any fuel burning equipment not equipped with any device or control equipment required to be fitted to such equipment? | 56.2 | 43.8 |
| (5) | Do you emit or cause or permit to be emitted any noise greater in volume, intensity or quality in contravention of the acceptable condition? | 58.5 | 41.5 |
| (6) | Do you pollute or cause or permit to be polluted any soil or surface of any land in contravention of the acceptable condition? | 58.5 | 41.5 |
| (7) | Do you place in or on any soil or in any place where it may gain access to any soil any matter whether liquid, solid or gaseous? | 46.4 | 53.6 |
| (8) | Do you establish on any land a refused dump, garbage tip, soil and rock disposal site, sludge deposit site, waste-injection well or otherwise used land for the disposal of or a repository for solid or liquid wastes so as to be obnoxious or offensive to human beings? | 52.0 | 48.0 |
| (9) | Do you establish on any land a refused dump, garbage tip, soil and rock disposal site, sludge deposit site, waste-injection well or otherwise used land for the disposal of or a repository for solid or liquid wastes so as to interfere with underground water or be detrimental to any beneficial use of the soil or the surface of the land? | 52.0 | 48.0 |
| (10) | Do you emit, discharge or deposit any wastes into any inland waters in contravention of the acceptable condition? | 46.7 | 53.3 |
| (11) | Do you place any waste in/on any water or in a place where it may gain access to any water? | 40.2 | 59.8 |
| (12) | Do you place any waste in a position where it falls, descends, drains, evaporates, is washed, is blown or percolated or is likely to fall, descend, drain, evaporate or be washed, be blown or percolated into any waters? | 55.6 | 44.4 |
| (13) | Do you place any waste in a position where knowingly or through his negligence, whether directly or indirectly, causes or permits any wastes to be placed in such a position? | 55.6 | 44.4 |
| (14) | Do you cause the temperature of the receiving waters to be raised or lowered by more than the prescribed limits? | 46.4 | 53.6 |
| (15) | Do you discharge or spill any oil or mixture containing oil into the Malaysian waters in contravention of the acceptable condition? | 47.1 | 52.9 |
| (16) | Do you discharge any wastes into the Malaysian waters in contravention of the acceptable condition? | 55.6 | 44.4 |

## DISCUSSIONS

Overall, the level of awareness on Environmental Quality Scheduled Wastes Regulations 2005 and the Environmental Quality Act 1974 was moderate (56.4% and 51.4%, respectively), as measured by mean. This result was inconsistent with the study by Ismail *et al.* (2012b), which found that the level of awareness on sustainable construction concept was below average. This could be due to the fact that the contractors were trying to be legitimate by complying with the laws and regulations, thus forcing the contractors to improve their awareness on environmental legislations. This can be explained by the coercive isomorphism tenet under the institutional theory introduced by DiMaggio and Powel (1983). Coercive isomorphism results from both formal and informal pressures. The pressures can be from other organizations, in which the organizations are dependent on cultural expectations from the society (DiMaggio & Powell, 1983). DiMaggio and Powell (1983) also found that such pressure may be felt as a force, a persuasion, or an invitation to join the collusion. In this paper, the pressure to have good knowledge on environmental legislations is probably driven by the sanction in the form of fines and penalties if the contractors fail to comply with the rules and regulations. For example, Environmental Quality Act 1974 covers "criminal sanction, being applied in dealing with pollution control and other environmental offences. In 1996, the Act was extensively amended to provide for stricter punishments for environmental criminal offences committed including to increase the amount of penalty from the maximum of RM 10,000 to RM 100,000 for pollution offences, and RM 500,000 for more serious offences" (Mustafa & Mohamed, 2015).

The findings from this paper were contributed by various initiatives undertaken by the government and professional bodies to increase the awareness and knowledge on this concept among the developers (Zainul-Abidin, 2010). The sharing of values on the importance of knowledge on environment legislations especially by professional bodies and training providers (e.g. CIDB) in the construction industry is evidence of normative isomorphism, in which, when applied, indicates that improving knowledge on environmental legislations becomes a shared norm among organizational members and it gains acceptance within the organizations.

RM refers to Malaysian Ringgit.

## CONCLUSION AND FURTHER WORK

From this study, a better understanding of the awareness level on environmental legislations was obtained. The findings from the study suggest that the overall level of awareness was moderate, which can be possibly explained by the coercive and normative isomorphism tenets. This suggests that the contractors were aware of the consequences of not complying with the environmental legislations, in line with the coercive isomorphism. In addition, the sharing of norms on the awareness on environmental legislations by professional bodies has been institutionalized in the construction industry, which is evidence of normative isomorphism.

There are several implications from this paper. Firstly, the relevant authorities may consider enforcing more rules on the disposal of construction wastes, which is claimed to be less stringent than the local authorities' monitoring. This is to signify that the construction industry players are socially responsible and legitimate in fulfilling the expectations from the society, which is being caring and responsible for the environment. This can be done by including the awareness on environmental legislations as part of the training modules by CIDB. Secondly, there must be full cooperation from the communities involved in the construction sector such as the construction industry, local authority and local people in improving the awareness and attitude on environmental legislations. Environmental protection is everyone's concern and it does not only lie in the hands of certain groups of people. This is to support the government's effort, which is to progressively advance the sustainable development agenda in the country. Hence, more promotions and publicities are needed to improve the level of awareness on environmental legislations in the country. Thirdly, construction players in Malaysia may imitate the best practices of environmental legislations, which have been successfully implemented by developing countries, such as Japan and Hong Kong. This may assist to improve the overall awareness of environmental legislations among construction players in Malaysia.

This study only focuses on two environmental legislations. Future studies may examine the level of awareness on other legislations, such as Solid Waste and Public Cleansing Management Act 2007. Also, future studies may obtain more insight by conducting interviews with other construction players concerning their level of awareness on environmental legislations.

This research is among the first few studies that examined the level of awareness on environmental legislations in Malaysia. It may provide insights for CIDB on how to improve the awareness on environmental legislations via seminars and trainings.

Also, a construction environmental awareness index can be developed to assess the level of awareness that can be used as one of the criteria for tender or contract awards.

With the promotion from the government and non-governmental institutions on sustainability, it is hoped that the awareness on environmental legislations among construction practitioners would improve in the near future.

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## REFERENCES

Elmualim, A., & Alp, D. (2016). Perception and Challenges for Sustainable Construction in Developing Countries: North Cyprus Case. *Journal of Civil Engineering and Architecture, 10* (2016), 492-500.

Act 127, Environmental Quality Act (1974). *Ministry of Natural Resources and Environment,* 1-17.

Act 520, Pembinaan Malaysia Act (1994), *Construction Industry Development Board*, 1-16.

Begum, R. A., Siwai, C., Pereira, J. J., & Jaafar, A. H. (2009). Attitude and behavioral factors in the construction industry of Malaysia. *Resources, Conservation and Recycling*, *53*, 321 – 328.

Begum, R. A., Satari, S. K., & Pereira, J. J. (2010). Waste Generation and Recycling: Comparison of Conventional and Industrialized Building Systems. *American Journal of Environmental Sciences*, *6*(4), 383-388.

Construction Industry Development Board (CIDB) (2000). *Malaysian Construction Industry: Technology Foresight Report.* CIDB Malaysia and APEC Technology Foresight Center, Bangkok.

Construction Industry Development Board (2007).Construction Industry Master Plan 2006- 2015.

DiMaggio, P., & Powell, W. (1983). The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Field. *American Sociological Review*, *48*(2), 147- 160.

Department of Statistic Malaysia. (2011). Economic Census 2011. Putrajaya:

Department of Statistics, Malaysia.

Faridah, A. H. A., Hasmanie, A. H., & Hasnain, M. I. (2004). A study on construction and demolition waste from buildings in Seberang Perai. *3rd*

*National Conference in Civil Engineering*, 20 – 22 July, Copthorne Orchid, Tanjung Bungah, Malaysia.

Hao, J. L., Hills, M. J., & Tam, V. W. Y. (2008). The effectiveness of Hong Kong's Construction Waste Disposal Charging Scheme. *Journal of Waste Management and Research*, *26*(6), 553-558.

Idris, N., Ismail, Z., & Hashim, H. (2015). Towards a Framework for Promoting Sustainable Construction In Malaysia. *Jurnal Teknologi*, 303 – 311.

Ismail, Z., Idris, N., & Mat-Nasir, N. (2012a). Sustainable Initiative and Impediments towards Promoting Sustainable Construction in Malaysia. *IEEE Colloquium on Humanities, Science & Engineering Research (CHUSER),* 3 – 4 December, Kota Kinabalu, Sabah, Malaysia.

Ismail, Z., Idris, N., & Mat-Nasir, N. (2012b). Comparative Analysis on the Policies in Promoting Sustainable Construction in Developed Asian Countries. *IEEE Symposium on Business, Engineering and Industrial Applications,* 23 – 26 September, Hyatt Regency Bandung, Bandung, Indonesia.

Ikau, R., Tawie, R., & Joseph, C. (2013). Initial Findings on Perspective of Local Contractors on Waste Minimization and Incentives on Construction Sites, *IEEE Business Engineering and Industrial Applications 2013 (BEAIC 2013)*, 7 – 9 April, Langkawi, Malaysia.

Joseph, C., & Taplin, R. (2012). Local Government Website Sustainability Reporting: A Mimicry Perspective. *Social Responsibility Journal*, *8*(3), 363 – 372.

Joseph, C., Gunawan, J., Sawani, Y., Rahmat, M., Noyem, J. A., & Darus, F. (2016). A Comparative Study of Anti-Corruption Practice Disclosure among Malaysian and Indonesian Corporate Social Responsibility (CSR) Best Practice Companies. *Journal of Cleaner Production*, 112, 2896 – 2906.

Kulatunga, U., Amaratunga, D., & Haigh, R. (2006). Attitudes and perceptions of construction workforce on construction waste in Sri Lanka. *Management of Environmental Quality: An International Journal*, *17*(1), 57–72.

Mahayuddin S. A., Prereiral, J. J., Badaruzzaman, W. H. W., & Mokhtar, M. B. (2008). Construction waste management in a developing country: case study of Ipoh, Malaysia. *WIT Transactions on Ecology and the Environment*, 109.

Mohd-Nasir, H., Yusoff, M. K., Sulaiman, W. N. A., & Rakmi, A. R. (1998). Issues and problems of solid waste management in Malaysia. *Proceedings on national review on environmental quality management in Malaysia: towards the next two decades*, 179 – 225.

Mustafa, M. (2011). Environmental law in Malaysia. Kluwer Law International BV. *The Natherlands*, 98-99.

Mustafa, M., & Mohamed, N. S. (2015). The Development of Environmental Crime and Sanction in Malaysia. *European Scientific Journal*, *11*, 29 – 39.

Nagapan, S., Rahman, I. A., & Asmi (2012). Factors Contributing to Physical and Non-Physical Waste Generation in Construction Industry. *International*

*Journal of Advances in Applied Sciences*, *1*(1), 1 – 10.

Omardin, M. A., Zainul, A. H., & Wan Ali, D. (2015). Concept of Environmental Sustainability Awareness Strategies in Pre-Construction Stage. *Journal of Tropical Resources and Sustainable Science 3(2015)*, 103−116.

Rahmat, N. S., & Ibrahim, A. H. (2007). Illegal Dumping Site: Case Study in the District of Johor Bahru Tengah, Penang, Malaysia.

Rahaman, A. S., Lawrence, S., & Roper, J. (2004). Social and Environmental Reporting at the VRA: Institutionalized Legitimacy or Legitimation Crisis? *Critical Perspectives On Accounting*, *15*(1), 35–56.

The Borneo Post (2013). 2012 Solid waste exceeds projected production in 2020. Retrieved from: http://www.theborneopost.com/2013/08/27/2012-solid-waste-exceeds-projected-production-in-2020/

Rao, A., Kumar, N., Jha & Misra, S. (2007). Use of aggregates from recycled construction and demolition waste in concrete. *Resources, Conservation and Recycling*, 50(1), 71-81.

Sasitharan, N., Ismail, A. R., & Ade, A. (2012). Construction waste management: Malaysian perspective. The International Conference on Civil and Environmental Engineering Sustainability IConCEES 2012. Retrieved from: http://eprints.uthm.edu.my/2530/1/Construction_Waste_Management_Malaysian_Perspective.pdf.

Wahi, N., Joseph, C., Tawie, R., & Ikau, R. (2016). Critical Review on Construction Waste Control Practices: Legislative and Waste Management Perspectives. *Procedia Social and Behavioral Sciences*, *224*, 276 – 283.

Yahaya, N., & Larsen, I. (2008). Federalizing Solid Waste Management in Peninsular Malaysia. *Proceeding of International Solid Waste Association (ISWA) World Congress, Singapore.*

Zainul-Abidin, N. (2009). Sustainable Construction in Malaysia – Developers' Awareness. *Proceedings of World Academy Of Science, Engineering and Technology.* Retrieved from: http://eprints.usm.my/20303/1/sustainable.pdf.

Zainul-Abidin, N. (2010). Investigating the Awareness and Application of Sustainable Construction Concept by Malaysian Developers, *Habitat International*, *34*, 421 – 426.

# APPENDIX

**Environmental Quality Scheduled Wastes Regulations 2005**

| Key Legal Provisions | | Awareness | |
|---|---|---|---|
| **Regulation 3. Notification of the generation of scheduled wastes** | | **Yes** | **No** |
| (1) | Every waste generator shall, within 30 days from the date of generation of scheduled wastes, notify the Director General of the new categories and quantities of scheduled wastes which are generated. | 75.5% | 24.5% |
| (2) | The notification given under sub-regulation (1) shall include the information provided in the Second Schedule. | 65.4% | 34.6% |
| **Regulation 4. Disposal of scheduled wastes** | | | |
| (1) | Scheduled wastes shall be disposed of at prescribed premises only. | 53.9% | 46.1% |
| (2) | Scheduled wastes shall, as far as it is practicable, be rendered innocuous prior to disposal. | 52.6% | 47.4% |
| **Regulation 5. Treatment of scheduled wastes** | | | |
| (1) | Scheduled wastes shall be treated at prescribed premises or at on-site treatment facilities only. | 67.3% | 32.7% |
| (2) | Residuals from the treatment of scheduled wastes shall be treated or disposed of at prescribed premises. | 51.3% | 48.7% |
| **Regulation 6. Recovery of material or product from scheduled wastes** | | | |
| (1) | Recovery of material or product from scheduled wastes shall be done at prescribed premises or at on-site recovery facilities. | 56.9% | 43.1% |
| (2) | Residuals from recovery of material or product from scheduled wastes shall be treated or disposed of at prescribed premises. | 50% | 50% |
| **Regulation 7. Application for special management of scheduled wastes** | | | |
| (1) | A waste generator may apply to the Director General in writing to have the scheduled wastes generated from the particular facility or process excluded from being treated, disposed of or recovered in premises or facilities other than at the prescribed premises or on-site treatment or recovery facilities. | 58.8% | 41.2% |
| (2) | An application under sub-regulation (1) shall be submitted to the Director General in accordance with the guidelines for special management of scheduled wastes as prescribed by the Director General and shall be accompanied by a fee of three hundred ringgit and shall not be refunded. | 57.8% | 42.2% |
| (3) | If the Director General is satisfied with the application made under sub-regulation (1), the Director General may grant a written approval either with or without conditions. | 59.5% | 40.5% |
| **Regulation 8. Responsibility of waste generators** | | | |
| (1) | Every waste generator shall ensure that the scheduled wastes generated b him are properly stored, treated on-site, recovered on-site for material or product from such scheduled wastes or delivered to and received at prescribed premises for treatment, disposal or recovery of material or product from scheduled wastes | 61.1% | 38.9% |

| | | | |
|---|---|---|---|
| (2) | Every waste generator shall ensure that the scheduled wastes that are subjected to movement or transfer be packaged, labeled and transported in accordance with the guidelines prescribed by the Director General. | 57.2% | 42.8% |
| **Regulation 9. Storage of scheduled wastes** | | | |
| (1) | Scheduled wastes shall be stored in containers which are compatible with the scheduled wastes to be stored, durable and which are able to prevent spillage or leakage of the scheduled wastes into the environment. | 54.9% | 45.1% |
| (2) | Incompatible scheduled wastes shall be stored in separate containers, and such containers shall be placed in separate secondary containment areas. | 65.4% | 34.6% |
| (3) | Containers containing scheduled wastes shall always be closed during storage except when it is necessary to add or remove the scheduled wastes. | 52.3% | 47.7% |
| (4) | Areas for the storage of the containers shall be designed, constructed and maintained adequately in accordance with the guidelines prescribed by the Director General to prevent spillage or leakage of scheduled wastes into the environment. | 57.5% | 42.5% |
| (5) (a) | Any person may store the scheduled wastes generated by him for 180 days or less after their generation provided that— (a) the quantity of scheduled wastes accumulated on site shall not exceed 20 metric tons. | 47.4% | 52.6% |
| (5) (b) | Any person may store the scheduled wastes generated by him for 180 days or less after their generation provided that— the Director General may at any time, direct the waste generator to send any scheduled wastes for treatment, disposal or recovery of material or product from the scheduled wastes up to such quantity as he deems necessary. | 66% | 34% |
| (6) | A waste generator may apply to the Director General in writing to store more than 20 metric tons of scheduled wastes. | 60.5% | 39.5% |
| (7) | If the Director General is satisfied with the application made under sub-regulation (6), he may grant a written approval either with or without conditions. | 54.2% | 47.6% |
| **Regulation 10. Labeling of scheduled wastes** | | | |
| (1) | The date when the scheduled wastes are first generated, name, address and telephone number of the waste generator shall be clearly labeled on the containers that are used to store the scheduled wastes. | 53.3% | 46.7% |
| (2) | Containers of scheduled wastes shall be clearly labeled in accordance with the types applicable to them as specified in the Third Schedule and marked with the scheduled waste code as specified in the First Schedule for identification and warning purposes. | 62.4% | 37.6% |
| (3) | No person is allowed to alter the markings and labels mentioned in sub-regulations (1) and (2). | 52.9% | 7.1% |
| **Regulation 11. Waste generators shall keep an inventory of scheduled wastes** | | | |
| (1) | A waste generator shall keep accurate and up-to-date inventory in accordance with the Fifth Schedule of the categories and quantities of scheduled wastes being generated, treated and disposed of and of material or product recovered from such scheduled wastes for a period up to three years from the date the scheduled wastes were generated. | 60.8% | 39.2% |

| | | | |
|---|---|---|---|
| **Regulation 12. Information to be provided by waste generators, contractors and occupiers of prescribed premises** | | | |
| (1) | A waste generator, contractor and occupier of the prescribed premises shall provide information in accordance with the Sixth Schedule in the manner provided in this regulation or Director General shall determine other methods as he thinks fit. | 52.9% | 47.1% |
| (2) | A waste generator shall complete Part I of the Sixth Schedule in six copies and hand over the six copies of the schedule to the contractor when the scheduled wastes are delivered to him. | 53.6% | 46.4% |
| (3) | The contractor shall, upon receiving the scheduled wastes from a waste generator, complete Part II of the Sixth Schedule in the six copies given to him by the waste generator and shall thereafter immediately hand over two copies of the Schedule to the waste generator who in turn shall submit a copy to the Director General within 30 days from the date of transportation of the scheduled wastes. | 51.6% | 48.4% |
| (4) | The contractor shall within 10 days from the date of receipt of the scheduled wastes deliver the scheduled wastes to the occupier of any prescribed premises and hand over the remaining four copies of the Sixth Schedule to the occupier. | 66% | 34% |
| (5) | The occupier of any prescribed premises shall, upon receiving the scheduled wastes from the contractor, complete Part III of all the remaining four copies of the Sixth Schedule handed over to him by the contractor and shall, upon completion, retain one copy and return a copy each to the contractor, the waste generator and the Director General, within 20 days from the date of receipt of the scheduled wastes. | 59.2% | 40.8% |
| (6) | If the waste generator fails to receive his copy of the Sixth Schedule from the occupier of the prescribed premises referred to in sub-regulation (5) within 30 days from the date of delivery of the scheduled wastes to the contractor referred to in sub-regulation (2), he shall notify the Director General immediately and shall investigate and inform the Director General of the result of his investigation. | 55.9% | 44.1% |
| (7) | The waste generator, contractor or occupier of the prescribed premises shall each keep a signed copy of the Sixth Schedule which shall be retained as a record for at least three years from the date the scheduled wastes are received by the occupier of the prescribed premises. | 49.7% | 50.3% |
| **Regulation 13. Scheduled wastes transported outside waste generators' premises to be accompanied by information** | | | |
| (1) | Every waste generator shall provide information in accordance with the Seventh Schedule in respect of each category of scheduled wastes to be delivered to the contractor and shall give the schedule to the contractor upon delivery of the wastes to him. | 54.9% | 45.1% |
| (2) | The waste generator shall inform the contractor of the purpose and use of the Seventh Schedule. | 50.3% | 49.7% |
| (3) | The contractor shall carry with him the Seventh Schedule for each category of scheduled wastes being transported and shall observe and comply with the instructions contained therein. | 51% | 49% |
| (4) | The contractor shall, in the selection of transportation routes, as far as possible avoid densely populated areas, water catchment areas and other environmentally sensitive areas. | 55.2% | 44.8% |
| (5) | The contractor shall ensure that all his employees that are involved in the handling, transportation and storage of scheduled wastes attend training programs. | 46.4% | 53.6% |

| | | | |
|---|---|---|---|
| (6) | The contractor shall ensure that during the training program, each employee is well informed of the purpose and use of the Seventh Schedule | 49.7% | 50.3% |

**Regulation 14. Spill or accidental discharge**

| | | | |
|---|---|---|---|
| (1) | In the event of any spill or accidental discharge of any scheduled wastes, the contractor responsible for the wastes shall immediately inform the Director General of the occurrence. | 64.7% | 35.3% |
| (2) | The contractor shall do everything that is practicable to contain, cleanse or abate the spill or accidental discharge and to recover substances involved in the spill or accidental discharge. | 52.9% | 47.1% |
| (3) | The waste generator shall provide technical expertise and supporting assistance in any clean-up operation referred to in sub-regulation (2). | 58.8% | 41.2% |
| (4) | The contractor shall undertake studies to determine the impact of the spillage or accidental discharge on the environment over a period of time to be determined by the Director General. | 49% | 51% |

**Regulation 15. Conduct of training**

| | | | |
|---|---|---|---|
| (1) | Every waste generator shall ensure that all his employees involved in the identification, handling, labeling, transportation, storage and spillage or discharge response of scheduled wastes attend training programs. | 57.5% | 42.5% |

**Regulation 16. Compounding of offences**

| | | | |
|---|---|---|---|
| (1) | Every offence which consists of any omission or neglect to comply with, or any act done or attempted to be done contrary to these Regulations may be compounded under Section 45 of the Act. | 56.9% | 43.1% |
| (2) | The compounding of offences referred to in sub-regulation (1) shall be in accordance with the procedure prescribed in the Environmental Quality (Compounding of Offences) Rules 1978 [P.U. (A)281/1978]. | 52.6% | 47.4% |