



INSIGHT JOURNAL

UNIVERSITI TEKNOLOGI MARA CAWANGAN JOHOR

**International, Refereed, Open Access,
Online Journal**

Volume 4 2019

eISSN : 2600-8564

Indexed in MyJurnal MCC

INSIGHT JOURNAL (IJ)

UiTM Cawangan Johor Online Journal Vol. 4: 2019
eISSN :2600-8564
Published by UiTM Cawangan Johor
insightjournal.my

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Sustainable Solid Waste Management from the Perspective of Strong Regulation

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Abstract

Despite the importance of the aspect of strong regulation towards a sustainable solid waste management system, there are still few studies focusing on analysing the sustainability of solid waste management from the perspective of strong regulation. Hence, this study aims to analyse the sustainability of the solid waste management system from the perspective of strong regulation. To conduct this study, Kota Kinabalu, Sabah was selected as a case study. Both qualitative and quantitative approaches were employed. The quantitative approach was mainly used to support the findings collected from the qualitative approach. Data collected were mainly through interviews, questionnaires and secondary data. Based on the overall findings, the study found that the sustainability of the existing solid waste management system in Kota Kinabalu, Sabah is still considered as unsustainable, as it still has weak regulation. This is reflected when the study found that the elements of strict enforcement and strict regulation in Kota Kinabalu were found to be less strict. Hence, the study suggests that to move towards a sustainable solid waste management system, it is important for the local government in Kota Kinabalu, Sabah to implement stricter enforcement and stricter regulation pertaining to its solid waste management.

Keywords: Solid waste management, Strong regulation, strict regulation, strict enforcement, policy.

1. Introduction

Solid waste is usually managed by the local government and it has been recognised as one of the major contributing factors towards the negative environmental impact in the world (Dawda Badgie, Samah, Manaf, & Muda, 2012; Schübeler, Wehrle, & Christen, 1996). This is reflected when the majority of the local governments around the world have experienced challenges in managing their solid waste (Omran, Mahmood, Abdul Aziz, & Robinson, 2009). It is further exacerbated with the growing number of people, as it leads to the increased of waste generation, especially since waste that is poorly managed may pose a negative impact to the environment (Onu, 2000; Tchobanoglous, Theisen, & Vigil, 1993). By referring to the concepts of Integrated Sustainable Solid Waste Management (ISWM), it is demonstrated that the issues of solid waste management are very complex, as it can not only be influenced by the aspect of technology, but it can also be influenced by other aspects, such as policy,

technology, economy, environment, social and institution (Klunder & Anschütz, 2001). Hence, it is wrong to assume that the issues of solid waste only involve one particular aspect such as technology. However, based on the previous studies, countries especially the developing ones tend to assume their issues of solid waste as purely technical (Guerrero, Maas, & Hogland, 2013; Klunder & Anschütz, 2001; Mosler, Drescher, Zurbrügg, Rodríguez, & Miranda, 2006). This is reflected when they tend to analyze their issues of solid waste management, solely from the perspective of technology (Guerrero et al., 2013; Klunder & Anschütz, 2001). Hence, the majority of the developing countries prefer to address their solid waste issues mainly from the perspective of technology (Agamuthu, 2004). This is reflected when there is an increase in technology transfer between the developed and the developing countries specifically technology relating to the solid waste disposal such as incinerator facilities (Agamuthu, 2004). Incinerator facilities are a common method used in the developed countries in disposing their solid waste, as it is considered as more environmentally friendly compared to landfilling (Dawda, 2010). Even though some developing countries have managed to improve their solid waste system after the adoption of such technology, others still fail to improve (Agamuthu, 2004). This suggests that relying on the aspect of technology alone is not a guaranteed solution in addressing the issue of solid waste. Furthermore, in most developing countries, there are still limited studies conducted in analyzing the sustainability of solid waste management from the perspective of policy, especially in the aspect of strong regulation, despite the results from previous studies which claim that the issues of solid waste management in developing countries are commonly associated with the aspect of policy (Agamuthu, Khidzir, & Hamid, 2009; Asase, Yanful, Mensah, Stanford, & Amponsah, 2009).

2. Background of Study

Kota Kinabalu is the state capital of Sabah, Malaysia and considered as the main entry to the state of Sabah (DBKK, 2011). It has a total population of 452 058 which mainly consists of Chinese (21%), Bajau (16%), Kadazan/Dusun (15%), Malay (8%), Murut (0.5%), other Natives (13%), Non-natives (1.5%) and Non-Malaysian Citizens (24%) (Fatma Sabariah, Manaf, & Mariani, 2013). Kota Kinabalu has a total area of 351 square kilometres and is adjacent to the districts of Tuaran and Penampang. The municipal solid waste management systems in Kota Kinabalu mainly fall under the administration of Kota Kinabalu City Hall (KKCH). This is clearly reflected in the Sabah local government laws under the Local Government Ordinance 1961, where it is mentioned that the responsibility of municipal solid waste management in Sabah falls under the respective city/municipal/district council and this responsibility includes the collection, treatment, and disposal of solid waste (MHLG, 2006; State of Sabah, 1979).

In Sabah, its local government is governed under Local Government Ordinance (LGO) (1961). The LGO allows the establishment of Local Government in Sabah and empowers the local government to perform a broad range of functions [15]. Section 49 (1) Part V defines these functions of the Local Government Ordinance (LGO) as:

- i. Keeping clean streets, bridges, squares, playing fields and other open or closed public places in the (LA) area (section 49(1)(39));

- ii. Requiring any owner or occupier of land to keep such land in a clean condition (section 49(1)(41));

Furthermore, the local government functions in Sabah are also described in the section 38 of the LGO, where the functions include to “control and care for public places, streets, etc., in urban areas”. However, contrary to Section 73 (1)(a)(l) of the Local Government Act, the section does not describe any provision pertaining to treatment, disposal and waste collection services to the owners’ premises or occupiers. The provision stated above that is to “keep clean streets, bridges, squares, playing fields and other open or closed public places”, is considered the only relevant provision (MHLG, 2006).

In addition, under the Local Government Ordinance, section 50 is considered as being the most important section in addressing issues of solid waste management because local authorities are permitted to create by-laws. Anti-Litter, Hawkers, Market and Conservancy and Hygiene are among the existing by-laws that are directly applicable to solid waste management. In July 2005, Anti-litter By-Law was revised and provided an additional strength to tackle issues of solid waste by enforcing higher penalty for wrongdoing (MHLG, 2007).

Based on Kota Kinabalu City Hall (KKCH) information report, the Anti-litter By-law pertaining to disposal of waste and littering in an open area has already been imposed. However, it can be seen that there is an absence of by-law pertaining to disposal, treatment and collection of refuse from commercial or other premises and household. The Health and Urban Services Department of KKCH is responsible to administer the municipal solid waste management and its responsibility consists of managing waste collection and improving the solid waste management in KKCH. The solid waste management and waste minimization that are carried out by the state are currently uncertain on which provision of the ordinance they should adhere to. Moreover, by-laws pertaining to this function are unavailable (MHLG, 2006).

Compulsory regulation on how to separate waste and official guidelines to separate solid waste management at source is unavailable in Sabah. In addition, householders are not compelled to separate their waste since none of the councils forces them to do so. Therefore, keeping the district under their authority clean and hygienic is the main function and task of the local government (MHLG, 2006). The local government may perform these functions through its legal power which includes:

a) Uniform (Anti-Litter) By-Laws 2010

The entire area covered by the jurisdiction of each Local Government in Sabah practices these By-laws (Fatma Sabariah et al., 2013).

- i. “Litter” means any dust, sand, earth, gravel, clay, stone, cement, paper, ashes, carcasses, refuse, leaves and branches, grass, straw, boxes, barrels, bales, shavings sawdust, garden refuse, stable refuse, trade refuse, manure, garbage, bottles, glass, can, food container, food wrapper, particles of food or other things,
- ii. Any person who places, throws or deposits or leaves behind any bottle, glass, can, food container, food wrapper, particles of food or other articles in any public places commits an offence under these By-laws.
- iii. Any person who commits a breach or contravenes any of the provisions of these By-laws shall be liable to a fine not exceeding ten thousand ringgit and in the case

of a continuing offense, to a further fine of five hundred ringgit a day after (Uniform Anti-Litter By-laws, 2010).

b) Conservancy and Hygiene, By-Laws 1984

The entire area covered by the jurisdiction of each Local Government in Sabah practices these By-laws (Fatma Sabariah et al., 2013).

- i. Every owner or occupier of any premise shall provide one or more dustbins as maybe necessary to contain the refuse there. Every dustbin shall be:
 - Provided with tight fitting cover or lid
 - Made from metal
 - Made with capacity of not less than one and half cubic feet and not more than three cubic feet
 - Approved by council in terms of design, size and shape
- ii. The occupier of any premise shall not deposit or cause or permit to deposit any dust, filth, ashes, or refuse, to be discarded there from anywhere unless it is collected in a plastic bag.
- iii. Any person who contravenes any of the provisions of these By-laws shall be guilty of an offense and shall be convicted to be liable to a fine not exceeding five hundred ringgit and where the offence is a continuing offence, to a further fine not exceeding five thousand ringgit a day during which the offence continues (Conservancy and Hygiene By-Laws, 1984)

Therefore, this demonstrates that, in Sabah there are existing laws that can be used to tackle the issues of solid waste management. However, issues of solid waste management in Kota Kinabalu, Sabah are still ineffectively addressed (Daily Express, 2015b, 2015c). These scenarios have raised several important questions on the existing solid waste management policy in Kota Kinabalu, Sabah particularly on whether it has strong regulations. According to Guerrero et al. (2013), the aspects of strong regulation are crucial aspects towards a sustainable solid waste management especially from the perspective of policy. Therefore, as mentioned earlier, this study attempts to analyze the sustainability of solid waste management system in Kota Kinabalu, Sabah from the perspective of strong regulation.

3. Literature Reviews

According to Guerrero et al. (2013), strong regulation plays important roles towards sustainable solid waste management particularly from the aspect of policy. Their study claimed that strong regulation in the context of solid waste management will help to improve the solid waste management performance and indirectly contributes to a sustainable solid waste management system. Previous studies have indirectly reflected that most municipalities that have weak regulation usually have lack of strict enforcement. According to Chris Zurbrügg and Schertenleib (1998), although most countries actually have developed relevant solid waste management law to tackle their solid waste issues, it is seldom enforced strictly. Agamuthu, Fauziah and Kahlil (2009) also strongly agree that the lack of strict enforcement towards the existing solid waste law is the main reason why most countries experience issues in their solid waste management. In fact, based on the study conducted by Mbiba (2014), the ineffectiveness of solid waste management in most urban areas is highly contributed to the lack of strict enforcement of its existing solid waste regulation.

In most developing countries, the lack of strict enforcement leads to weaker regulations in its solid waste management system. In fact, it was found that although some developing countries have more advanced solid waste law than the developed countries, they still fail to tackle their solid waste issues due to the lack of strict enforcements of their existing solid waste law (Mcallister, 2015). This also demonstrates that having developed solid waste law does not guarantee that issues of solid waste are tackled if the law is not strictly enforced. Moreover, according to the study conducted by Seng et al. (2010), developing countries like Cambodia have a lack of strong regulation in their solid waste management system due to the absence of strict enforcement. As a result, issues of illegal dump in their city are still unable to be addressed despite having developed relevant laws to address the issues. Similarly, due to the lack of strict enforcement in the city of Malang and Yogyakarta in Indonesia, its local government still fails to improve its solid waste management despite having developed relevant laws to tackle the issues (Meidiana & Gamse, 2011).

Moreover, similar issues are also faced by developing countries like Malaysia. The Malaysian government still experiences major issues in their solid waste system despite having introduced many policies to address the issues. For example, due to the lack of strict enforcement, the activity of waste recycling still does not show any significant changes despite the recent introduction of mandatory waste separation at the source to support the recycling activity (Moh & Manaf, 2014). A previous study has shown that, the law that is not strictly enforced will not be respected by the public (D Badgie & Muda, 2009). As a result, the solid waste management policies may not be able to be effectively implemented.

In addition, similar issues also have been experienced by other developing countries in Africa. For example, in the city of Bolgatanga in Nigeria, due to the lack of strict enforcement, its local government also still fails to improve its existing solid waste management system despite having developed laws which are relevant in addressing the issues (Ampofo, Kumi, & Ampadu, 2015). Thus, this supports the study conducted by Al-Khatib, Monou, Abu Zahra, Shaheen and Kassinos, (2010), who pointed out that the lack of strict enforcement is the main challenge of most developing countries in achieving sustainable solid waste management.

Apart from strict enforcement, previous studies have indirectly shown that many countries that have weak regulation are highly associated with the lack of strict regulation. According to Pokhrel and Viraraghavan (2005), the absence of strict regulation contributes towards the major issues of solid waste management in Nepal, particularly in the aspect of illegal waste dumping. This is also supported by the study conducted by Kum, Sharp and Harnpornchai (2005) who pointed out that it is important to develop stricter regulation, especially to control the solid waste issues experienced by most local authorities. This is indirectly reflected when developing countries like Thailand faces difficulties in promoting the activity of waste recycling due to the lack of stricter regulation to promote such activities (Muttamara, Visvanathan, & Alwis, 1994).

To support the element of strict regulation, previous studies indirectly show that mandatory law and monetary penalties play important roles. According to Sakawi (2011), mandatory law and monetary penalties will help to support the implementation of the solid waste management policy. With the presence of mandatory laws and monetary penalties, it gives the power to the local authorities to take action on those who violate the laws. Solid waste management policy will be ineffective if there is no regulation to support the policy. As an example, the waste recycling campaign that has been organized by the Malaysian government in 1993 failed to meet its objective because it was not supported by stricter regulation that is the lack of mandatory and monetary penalties (Yiing & Latifah, 2014). Similarly, due to the absence of mandatory laws, it becomes challenging for the government of Nepal to implement its solid waste management policy effectively in its capital city (Thapa, 1998).

In addition, a previous study has also shown that the absence of monetary penalties will reduce the public motivation in taking part in addressing the issues of solid waste (Zuilen, 2006). In fact, in Singapore, imposing higher monetary penalties will motivate the public to follow the solid waste management law (Coffey & Coad, 2010). Similarly, according to Papargyropoulou, Padfield, Rupani and Zakaria (2014), in order for the developing countries to meet sustainable solid waste management, it is crucial to impose higher monetary penalties to those who breach the law. This indirectly supports the study conducted by Zuilen (2006), where he pointed out that low monetary penalty will make the public become unmotivated in supporting the solid waste management policy.

Summary of the Aspect of Strong Regulation

The previous section has attempted to explore and discussed the term of strong regulation as highlighted by Guerrero et al. (2013). Although the previous section does not explicitly define what adequate policy is, it has somehow guided the study to summarize that a strong regulation in the context of solid waste management refers to having a strict enforcement and strict regulation (see Figure 1). Therefore, based on the literature discussed in the previous section, there are two important elements identified under the aspect of strong regulation. The first element is known as strict enforcement. Based on the previous literature, strict enforcement mainly refers to the ability of the government especially the local authorities to implement its existing solid waste regulation strictly. Previous literature shows that without strict enforcement, it will become a challenge for the local authorities to implement its solid waste management policies effectively. In fact, studies have shown that, having developed solid waste law may not be useful if it is not enforced strictly.

Moreover, the second element identified under the aspect of strong regulation is strict regulation. Based on the previous literature discussed in the previous section, it indirectly shows that strict regulation consists of the element of mandatory law and monetary penalties. These two elements are very important in the aspect of strict regulations because it helps to deter the public from breaching the law. This is because based on the previous study, it is demonstrated that the public will be more reluctant to breach the solid waste law if the government puts the element of mandatory law and monetary penalties.

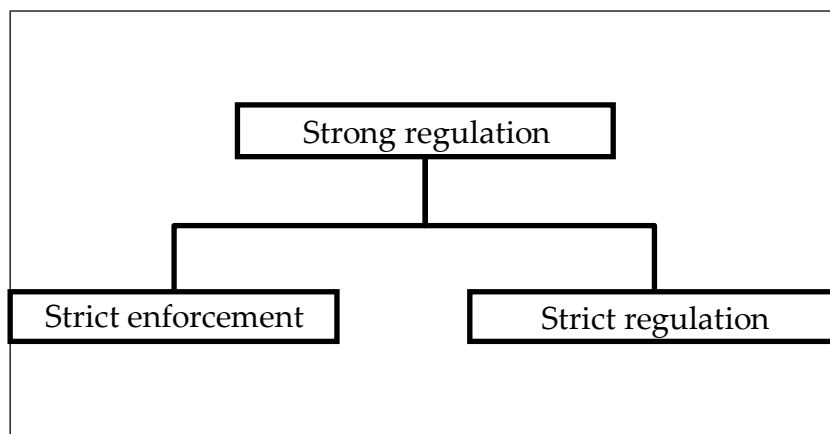


Figure 1: Aspect of strong regulation

4. Methodology

This study employed the quantitative and qualitative approaches. The data collected from the quantitative approaches were mainly used to support the data collected from the qualitative approaches. Secondary data were mainly collected from the journals, newspapers and relevant solid waste management policies such as Local Government Ordinance 1961, Kota Kinabalu Municipal Council (Anti-litter) By-laws, 1984, and Kota Kinabalu Municipal Council (Conservancy and Hygiene) By-laws, 1984. Meanwhile, data collected from primary data were mainly collected from the questionnaires and interviews. A total of 267 households were selected as sample from a total population of 452 058 in the study area (Kota Kinabalu). According to Roscoe (1975), sample sizes that are more than 30 and less than 500 are appropriate for most research. This is also supported by the study conducted by Nguyen, Zhu and Le (2015) where their study only used a sample size of 180 despite the total population of their study area that is more than 400 000. Furthermore, eight respondents from the key officials in the Kota Kinabalu City Hall (KKCH) were interviewed. Based on the studies conducted by Wan A Kadir (1997), conducting an interview with the practitioner may provide better depth of the data, especially regarding the aspect of solid waste management. The respondents consisted of the Mayor of KKCH, Director of Environmental and Health Department and two officers under this department, one officer from the Legislation Department, one officer from the Engineering Department, one officer from the Enforcement Department and former Director of KKCH. The respondents from KKCH were purposely selected as this organisation is directly responsible in developing the solid waste management policy in Kota Kinabalu. In fact, this organisation is one of the local governments in the state of Sabah which is indirectly responsible of the management of solid waste. Data collected from the secondary data and interviews were analysed using the thematic analysis, while data collected from the questionnaires were analysed using the Statistical Package for the Social Sciences (SPSS).

5. Findings and Analysis

Table 1: Findings from interviews and secondary data

Aspect	Elements	Findings from interview and secondary data
Strong regulation	Strict regulation	Less strict
	Strict enforcement	Less strict

Table 1 presents the overall findings collected from the interviews and secondary data. The findings demonstrate that the element of strict enforcement and strict regulation in the existing solid waste management system in Kota Kinabalu, Sabah are less strict.

Table 2: Level of strict enforcement

	Mean		N	%
Strict enforcement	1.59	Less strict	192	71.9
		Somewhat strict	52	19.5
		Very strict	23	8.6

N=267

Table 2 indicates that the overall level of comprehensive policy in the existing solid waste management in Kota Kinabalu as less strict (71.9%), with the mean score of 1.59 (of the highest 5). This implies that the majority of respondents perceived the existing solid waste enforcement in Kota Kinabalu as less strict.

Table 3: Level of Strict regulation

	Mean		N	%
Strict Regulation	1.40	Less strict	183	68.5
		Somewhat strict	60	22.5
		Very strict	24	9.0

N=267

Table 3 indicates that the overall level of strict regulation in the existing solid waste management in Kota Kinabalu as less strict (68.5%), with the mean score of 1.40 (of the highest 5). This implies the majority of the respondents perceived the existing solid waste management regulation in Kota Kinabalu as less strict.

6. Discussion

As mentioned earlier, the aspect of strong regulation refers to the solid waste management regulation that has the element of strict enforcement and strict regulation. Based on the overall findings, it can be concluded that the aspect of strong regulation in the existing solid waste management system in Kota Kinabalu is still considered as weak. This indirectly shows that the element of strict enforcement and strict regulation in the existing solid waste management system in Kota Kinabalu are found to be less strict.

Based on the previous studies, weak regulation may affect the overall solid waste management system as it contributes towards many issues of solid waste such as the increased activity of illegal waste dumping, environmental pollution, and unsystematic solid waste management system. In the first section, it will discuss the findings regarding the element of strict enforcement under the aspect of strong regulation. As mentioned earlier, strict enforcement refers to the ability of the government especially the local government to strictly enforce solid waste management regulation. Based on the overall findings, the study found that the enforcement of solid waste management law in Kota Kinabalu is still considered as less strict. This is reflected when the overall findings collected from the secondary data and interviews found that the existing solid waste management enforcement

in Kota Kinabalu is still considered as less strict (see Table 1). In addition, the findings are also supported by the findings collected from the questionnaires. Based on Table 2, the majority of the respondents perceived the enforcement of laws relating to solid waste management in Kota Kinabalu as less strict.

Moreover, the overall findings of the study are consistent with the previous studies, where the previous studies demonstrated that in Kota Kinabalu, the local government still has to face many challenges in enforcing laws that are relevant to solid waste management. As an example, in Kota Kinabalu, the local government still faces many challenges in enforcing the Anti-litter by-law. This is indirectly reflected when the issue of indiscriminate dumping is still persisted in Kota Kinabalu [39]. The main findings also show that the lack of adequate enforcement personnel has also contributed to the poor enforcement in Kota Kinabalu. In fact, according to Goh Ban Lee (2007), in general, the lack of adequate enforcement personnel is considered as the main contributing factor towards the poor enforcement of solid waste laws in Malaysia. This is further exacerbated when the local government in Malaysia is not only responsible for handling matter pertaining to solid waste management [26]. This is because apart from managing the aspect of solid waste, the local government has other responsibilities such as managing the aspect which relates to environmental protection and building control, maintaining public amenities, social functions, and town planning and control [26]. Therefore, since the local government has various responsibilities, the local government may be unable to focus merely on enforcing laws that are relevant to solid waste management, since they also need to enforce other laws that are not related to the aspect of solid waste management. Hence, this indirectly contributes to the less strict enforcement.

The lack of strict enforcement in Kota Kinabalu has indirectly contributed towards the issues of solid waste management system in Kota Kinabalu. This is because the previous studies have shown that the public will not respect laws that are not being implemented strictly and may tend not to obey the laws. As an example, this study suggests that although there are existing laws such as Anti-Litter Bylaws 2005 in Kota Kinabalu to address the problem of littering, the lack of strict enforcement in Kota Kinabalu contributes to the ineffectiveness of the laws to address such issues. As a result, it contributes towards various solid waste issues in the Kota Kinabalu city such as indiscriminate waste dumping, unsystematic solid waste management system and environmental pollution. Moreover, it also leads to various problems such as leachate, blocked manholes, and drain in the city. In fact, according to Mr. Robert Lipon who is the Health and Environmental Services Department Director of Kota Kinabalu City Hall, the indiscriminate dumping in the Kota Kinabalu city may not only cause an eyesore but it also attracts pests, rodents, and insect that can transmit diseases [40].

Furthermore, based on the main findings, the solid waste management laws in Kota Kinabalu is considered as less strict when the study found that the local government in Kota Kinabalu is not being strict in enforcing laws related to solid waste management. As an example, based on the findings collected from the interviews, as of 2016 the local government in Kota Kinabalu has never taken any court action to those who have violated the Kota Kinabalu Municipal Council (Anti-litter) By-laws, 1984 and Kota Kinabalu Municipal Council (Conservancy and Hygiene) By-laws, 1984 ever since it was established. This indirectly shows the local government in Kota Kinabalu is not strict in enforcing the laws. In fact, according to Chua and Haijon (2012), enforcing the Anti-litter by-laws in Kota Kinabalu is difficult since the enforcement officers often have to deal with litterers who do not want to cooperate. This is consistent with the previous study, where in general the enforcement culture in Malaysia, especially in the aspect of solid waste management, is still considered as poor [41].

Besides, the element of strict enforcement in the existing solid waste management system in Kota Kinabalu is still considered as less strict when the study found that the local government in Kota Kinabalu is being lenient in enforcing the by-laws. As an example, through the interviews, the study found that the local government in Kota Kinabalu entertained the public request to get their compound to be reduced or waived. However, by giving a discount, this study suggests that it may indirectly send wrong messages to the public as they might perceive local government as being flexible towards enforcing the by-laws. If the by-laws are not being implemented strictly, the people may possibly lose their respect towards the law. In fact, according to Badgie and Muda (2009), the public only tend to respect laws that are strictly executed. Besides, according to Coffey and Coad (2010), strict enforcement will encourage public obedience towards the laws and in the long run, may cultivate positive environmental culture among the public.

In addition, less strict enforcement is indirectly reflected in the existing solid waste management in Kota Kinabalu, particularly in the aspect of scavengers. Although scavenger is not allowed to enter the landfill site, specifically in the area that is hazardous to the public health, the study found that the local government in Kota Kinabalu deliberately allows them to enter the landfill to perform waste picking as they contribute towards the aspect of waste recovery. In fact, this is also supported by the study conducted by Juzhar Jusoh (2000), who pointed out that the majority of the municipal in Malaysia deliberately allows the waste picker or scavenger to enter the landfill, as they contribute to the aspect of waste recovery. This indirectly reflects that the existing solid waste management in Kota Kinabalu lacks the element of strict enforcement. Therefore, based on the overall findings, it can be concluded that the element of strict enforcement in Kota Kinabalu solid waste management system is still considered less strict.

In short, the poor enforcement of the existing solid waste management laws in Kota Kinabalu contributes to the various negative environmental effects in the city.

The previous section has discussed the findings regarding the element of strict enforcement, while the following section will discuss the findings regarding the second element under the aspect of strong regulation known as strict regulation. Based on the overall findings, the study found that the element of strict regulation in the existing solid waste management system in Kota Kinabalu is still considered as less strict.

This is indirectly reflected in the findings collected from the secondary data and interviews, when the findings show that there is still a lack of strict regulations to cover the entire aspect of waste minimisation in Kota Kinabalu. As an example, there is still no mandatory law developed in the aspect of waste recycling, waste separation and waste composting in Kota Kinabalu. Moreover, the findings collected from the secondary data and interviews are also supported by the findings collected from the questionnaires, where the majority of the respondents perceived the level of strict regulation in Kota Kinabalu as less strict. This finding indirectly indicates that the element of strict regulation in Kota Kinabalu is considered as less strict.

Moreover, the overall findings of the study are consistent with the previous studies. According to Fatma Sabariah et al. (2013), in Sabah, there is still a lack of mandatory law developed pertaining to waste separation. Hence, the local government in Sabah is unable to force the public to segregate their waste. The lack of mandatory laws developed pertaining to the aspect of waste separation indirectly indicates the existing solid waste laws in Kota Kinabalu is considered as less strict. Without enforceable law, policy implementation becomes difficult and may not be successful. Sakawi (2011) claimed that to ensure more effective

implementation of municipal solid waste management (MSWM), it is important for the government to introduce mandatory laws pertaining to its solid waste generation, collection, treatment and disposal. In addition, he also claimed that fines not only need to be imposed to those who violated the laws but should also be implemented with integrity and persistence.

The lack of strict solid waste management regulation in most developing countries contributes towards the poor solid waste management system. According to Thapa (1998), the lack of mandatory laws in environmental conservation and management makes it difficult for the developing cities like the capital city of Nepal, Kathmandu to achieve any of its policy objectives. Apart from that, Zuilen (2006) also pointed out that the lack of monetary penalties will contribute towards the low participation of the public in addressing the solid waste issues. In fact, the existence of strict monetary penalties is the key strategy used by the Singapore to address their solid waste issues.

Furthermore, this study suggests that the growing number of waste generation in Kota Kinabalu may be indirectly contributed by the lack of strict regulation in Kota Kinabalu, since there is an absence of strict laws to control the waste generation from the point of generation. The results are broadly consistent with the study conducted by Muttamara et al. (1994), where their study has found that the lack of the element of strict regulation in the aspect of waste recycling in the major city in Thailand is the main contributing factor towards the poor implementation of the activity of waste recycling in the city. Likewise, Pokhrel and Viraraghavan (2005), found that the issues of illegal waste dumping in the developing country like Nepal are highly contributed by the lack of stricter regulation introduced by its government.

Due to the lack of stricter regulations in the aspect of waste prevention and waste reduction in Kota Kinabalu, it may indirectly contribute towards the increasing number of waste sent to the landfill in Kayu Madang and reduces its lifespan. In contrast to other developed countries, the existence of stricter regulation to control their waste from the point of generation has significantly contributed towards their sustainable solid waste management system (MHLG, 2006). Additionally, in most of the developed countries like in the Europe, the introduction of stricter regulations on the category of waste that can be disposed at the landfill has significantly contributed towards the increase of waste recycling and waste recovery (Defra, 2007).

Therefore, to ensure more sustainable solid waste management in Kota Kinabalu, it is important for the government to develop a stricter regulation regarding their solid waste management. In fact, the introduction of mandatory waste separation in the West Malaysia indirectly shows that a stricter regulation specifically in the aspect of waste separation is important towards a sustainable solid waste management in Malaysia. Apart from that, the lack of stricter regulation in the aspect of waste minimization in Kota Kinabalu may indirectly demonstrate the solid waste management policy in Kota Kinabalu as incomprehensive. This is because based on the concepts of waste management hierarchy, the aspect of waste minimization is considered one of its main elements. Failure to emphasize on this aspect demonstrates incomprehensiveness in the policy. Therefore, the element of strict regulation in Kota Kinabalu is still considered as less strict.

7. Conclusion

Based on the overall findings, the study suggests that the existing solid waste management in Kota Kinabalu may not be sustainable as the overall findings show that the aspect of strong regulation in Kota Kinabalu is still considered as weak. This is reflected when the study found that the element of strict enforcement and strict regulation under the aspect of strict regulation are less strict. Therefore, to achieve a sustainable solid waste management system from the perspective of strong regulation, it is important for the local government to ensure stricter enforcement as well as introduce stricter regulation pertaining to its solid waste management.

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**International, Refereed, Open Access,
Online Journal**

Volume 4, 2019

eISSN : 2600-8564