American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-03, Issue-06, pp-82-91
www.ajer.org

Research Paper Open Access

Municipal Solid Waste Management: Household Waste Segregation in Kuching South City, Sarawak, Malaysia

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Abstract: **-** Malaysia is faced with daunting challenges relating to household waste segregation. Due to an increase in population, economic growth, enforcement, infrastructure, public attitude, awareness and participation among others, source segregation is considered a crucial issue in Malaysia, particularly in urban settings. This paper presents the key findings of the quantitative (questionnaire) survey administered among 235 households in Kuching South City and qualitative (interview) survey with the Natural Resource & Environmental Board (NREB) and Kuching South City Council. This survey attempts to identify the limiting and motivating factors on the part of households to waste segregation. The result shows that age, sex, race and education is insignificant towards waste segregation. The result also shows a significant difference between waste segregators and non-waste separators on their level of perception towards implementation of laws for source segregation. Result also shows that the ease of access to facilities and the methods of collection are the major limiting factors preventing households from waste segregation in Kuching South City.

Keywords: *- Awareness, Enforcement, Infrastructure, Participation, Source segregation*

I. INTRODUCTION

A recent interview with Natural Resource and Environmental Board-NREB (whose mission is to efficiently regulate and enforce environmental laws for the protection of the environment and well-being of Sarawak) revealed that landfill still remains the most common waste treatment method in Kuching South City, whereby more than 70 percent of wastes are disposed using this method. However, this problem faced is particularly common among developing countries, especially Asia, which usually result into short lifespan of landfill and high consumption of landfill space. This problem of disposal to landfill is often compounded by trends in consumption, production patterns, continuing urbanization and most importantly the attitude and involvement of the waste generators and the communities at large towards source segregation of waste and in recycling. Legislative restrictions in many developed countries now mandate costly design and testing criteria for landfills. For instance, the German government sets high standards for access to a final storage site where all material designated for landfills has to be checked and must not contain substantial amounts of soluble salts [1].

Incineration, another common waste treatment method, is always criticized unsuitable nowadays due to air pollution problems and high construction and operation costs [2]. As Malaysia falls within the tropical rainforest region with high humidity, the solid waste has very high moisture content. Therefore, burning such waste in the incinerator consumes much energy than waste from drier region. In view of this, recycling is much more than an alternative landfill and incineration. Recycling helps to direct materials from the waste stream so that they may be re-used and turned into another material. The benefit of recycling are in many forms, such as reduction of environmental damage, energy saving, resources conservation and saving collection and disposal costs [3]. Besides that, the recycling of waste materials, if organized and managed properly can lead to gainful employment [4]. In addition, for recycling to be effectively managed, waste segregation needs to be inculcated in its curriculum.

Although, waste segregation at source has been acknowledged an efficient strategy for recycling, hence its full potential and benefits are yet to be realized or utilized and the rate of public participation has continued to remain low in Kuching South City due to waste generators perception and attitude towards it. In addition, there is no handy and dependent guideline for municipal solid waste management planners interested in

designing a waste segregation initiative in Kuching City to lay hand on. In household waste management policy, the development of valorization techniques for municipal solid waste management must be supported by convenient instruments and incentives [5]. In view of this, waste segregation needs to be adequately communicated to the public, so that residents' habits, behavior and traditions can be changed for the better, thus enabling local authorities to achieve government goals towards solid waste management [6].

Periodic research has been performed where new methods and technologies have been developed to find a friendly solution to the issue in waste segregation particularly involving the waste generators to separate their recyclables. However, the growing trend and concern about the environmental sustainability, public awareness and community involvement in waste segregation has continued to mount more pressure in Malaysia municipal solid waste management. Attitudes and perceptions toward waste segregation at source and rating of waste disposal issues in people's minds and in the scheme of official development plans have not been adequately considered which has thus led to the recent upsurge in waste disposal problems in developing countries [7]. Communities don't have the attitude as long as their wastes are collected, "I don't care about what comes out of the waste, where and how those wastes are disposed as long as they are collected from my surrounding". The perception of the community in waste segregation cannot be denied and is important to examine for the purpose of improving the municipal solid waste management strategies to manage, prevent and mitigate excessive waste disposed to landfill thus extending the lifespan of the landfill.

Based on these challenges in the attitude towards waste segregation that this study was necessitated. As can be seen in a wide spectrum, source segregation are not given adequate attention to, as the waste generators are not considered in its planning and design stage because their "felt needs" are not highlighted and determined. This paper presents a preliminary studies carried out to determine households perceptions; their limiting and motivating factors toward waste segregation and also to determine whether there are existing infrastructure and legislative setup to support household participation in waste segregation in Kuching South City.

II. MUNCICIPAL SOLID WASTE SOURCE SEGREGATION

Source segregation refers to the separation of the proposed 'useful' materials from the waste stream at the point of generation. Segregation of waste can save valuable resources in the form of saved hours required to deal with the un-segregated waste. With the segregation of waste at the source point, the amount of waste going to the landfill is greatly reduced [8]. Further, in the absence of the waste segregation, composting or recycling is not possible. In addition to this, the environmental damage and filth associated with un-segregated waste poses a health threat to the people, which can be avoided by proper segregation method [8].

Discarded products and waste materials potentially still have some economic value if reused or returned to the technological cycle. However, source segregation is one of the prerequisites for successful and economically feasible recycling activities. Rather than considering MSW simply as residue to be thrown away, it should be recognized as resource materials for the production of energy, compost and fuel depending upon the economically viability, local condition and sustainability of the project on long term [9] which can be made effective by source segregation. The common MSWM problem of developing countries, especially in Asia is that waste segregation is either not yet started or not optimized enough to allow proper waste treatment. Recyclables are not separated at source and are mixed with organic waste thus making it difficult to separate. Additionally, the moisture level of the mixed waste is high. This high moisture level is true especially in countries like India, Indonesia, Sri-lanka, Bangladesh, Malaysia and Thailand. However, the potential of these high moisture waste to be made into compost is ruined by the contamination of hazardous waste which is included in the mixed waste, making it a lower quality, if not, toxic containing compost that farmers are reluctant to buy and apply to their crops [10].

III. CONSTRAINTS TO PARTICIPATION IN SOURCE SEGREGATION

The perception of one's capability is said to set a limit to do what to do and untimely what can be achieved [11]. The influence of perception which describes how a person views himself and the world around him and how it tends to govern behavior is explained by Anomie theory [12] which explains that deviance can arise by accepting culturally determined goals without the acceptability of cultural means. In this case, it translates to either paying for MSWM service or the total rejection of its cost recovery methods. In this wise, individual's perception of (touching issues of taxes revenues, government sincerity, etc) will influence the cultural values, responses, and success of the municipal solid waste management system. Hence, people's perception on fees and on waste collection services is primordial for its willingness to pay. More importantly, when it is perceived by the people that waste services is paid for through taxes or even considered as a social service to be paid for by the government.

Some scholars have identified factors influencing the elements of the waste segregation systems. Households attitudes related to separation of waste are affected by the active support and investment of a real

estate company, community residential committees' involvement for public participation [13] and fee for collection service based on the waste volume or weight [14]. Gender, peer influence, land size, location of household and membership of environmental organization explain household waste utilization and separation behavior [15]. In relation to recycling, social influences, altruistic and regulatory factors are some of the reasons why certain communities develop strong recycling habits [16]. The authors also showed that people who frequently go to the bins to dispose of general refuse are more likely to recycle some product at home, and in most cases, as the distance to the recycling bins decreases, the number of fractions that citizens separate and collect at home increases. In order to increase recycling rates, the government should encourage markets for recycled materials and increasing professionalism in recycling companies [17]. Other factors mentioned by other scholars are financial support for waste segregation & recycling projects and infrastructures [18], recycling companies in the country [19], drop-off and buy back centers [20] and organization of the informal sector [21]. Household waste segregation is also affected by the aspects of enabling factors that facilitate the performance of the system. They are: technical, environmental, financial, socio-cultural, institutional and legal. Literature suggests that technical factors influencing the system are related to lack of technical skills among personnel within municipalities and government authorities [22], deficient infrastructure [23], poor roads and vehicles [19], insufficient technologies and reliable data [24].

The lack of coordination of coordination among the relevant agencies often results in different agencies becoming the national counterpart to different external support agencies for different solid waste management collaborative projects without being aware of what other national agencies are doing. This leads to duplication of efforts, wasting of resources, and unsustainability of the overall municipal solid waste management programmes. The lack of effective legislation for solid waste management, which is a norm in most developing countries, is partially responsible for the roles of the relevant agencies not being clearly defined and the lack of coordination among them [25].

IV. MUNICIPAL SOLID WASTE SEGREGATION IN MALAYSIA

The way humans respond and co-operate on waste management issues is influenced by their education [26], therefore, the public's education is an essential element of the success of any waste management program [27]. In Malaysia, environmental awareness among the public generally is still not adequate. In 1988, The Government of Malaysia had introduced the Action Plan for a Beautiful and Clean (ABC) Malaysia, followed by a recycling campaign in consecutive years. However, the campaigns do not lead to a positive result due to minimal responses from the public [28].

Several studies in Malaysia on household participation in recycling/buyback at designated centres show low participation. A study by [29] on the recycling program in Pandan Indah residential area in Selangor showed inconsistency in the operational schedule of the recycling/buy-back centre due to the high operational costs. The buy-back centre was managed by Alam Flora Sdn Bhd (AFSB), a private solid waste concessionaire with the responsibility to manage, collect and dispose solid waste. Another problem identified was difficulty in locating recycling bins in a study of residential areas in Selangor, Ampang Jaya and Subang Jaya [30]. In 2001, a recycle campaign was launched in Penang State with the aim to encourage Penang residents to recycle at least 1% of their daily waste generated. However, the campaign with the motto of "Kembalikan Sinar kepada Pulau Mutiara" (Restore the Shine to the Pearl of the Orient) had not made a positive impact on Penang's waste management problem. The recycle bins had been misused where about 40-60% of the contents were found to be non-recycle items [31]. In 2007, a recycling bank programmme was launched in two schools in Balik Pulau, Penang title "Turning trash into treasure" where recycling banks were made available for the two schools. This programme succeeded in getting minimal attraction of the pupils likewise also faced management challenges as the recyclables received from the participating students were salvaged by the school cleaners [32]. Likewise in 2008, a composting programme in Subang Jaya with the Motto "Source Segregation of food waste from Hawkers –turning waste into compost". This programme didn't yield a positive outcome as the food waste bins provided were mixed with non-food waste such as Fork, spoons, straws, chopsticks, etc. Other factors such as Poor awareness & training and lack of Incentives to encourage the Hawkers were identified [33]. Other programmes that faced similar challenges such as low awareness and lack of encouragement to the generators were " Glass recycling in Kuantan in 2008" [34], "Composting – closing the loop in Majlis Bandaraya Petaling Jaya (MBPJ) in 2008" [35]. Generally, Malaysian still have very low awareness on the importance of involvement in recycling programs.

It is clear to see that the current practice does not reflect waste management policy in place. Factors such as lack of implementation, weak enforcement, uncertainty over roles and responsibilities amongst governing authorities and limited stakeholder coordination have all contributed towards this disconnect between policy and practice. Furthermore, despite efforts by the MHLG, public awareness of the Municipal solid waste is low. However, the Malaysian Government recognizes that appropriate waste management is essential in achieving sustainable development as highlighted by the Malaysian Government Model [36].

To be successful, recycling programs require active and sustained participation of people [37]. As part of these efforts, households are being encouraged in several countries to start recycling through the separate collection of different materials [38]. A statistical study on factors affecting recycling activities in a Malaysian middle-class municipality in Subang Jaya, Selangor, identified that awareness creation should be given high consideration [39]. The study suggested an increase in recycling facilities. Another study also suggested monetary incentives approach to boost recycling activities at the household level [40]. None of the various studies conducted locally, investigated in detail the problems of the households carrying out recycling activities, considering the various recycling methods and socio-economic background and demography of such households.

V. RESEARCH METHODOLOGY

In order to produce both quantitative and qualitative data, a range of research methods covering questionnaires, interviews and document reviews were used in this study [41]. An outline of the approach used in the planning and execution of the data collection process is listed in Table 1.

For the household survey (see Item 1 in Table 1), a sample size of 235 households was determined based on statistical method for stratified sampling according to the areas (high, middle and low income areas). Trained research assistance was employed for both surveys due to the fact that the researcher is an international student. Interviews were conducted with Natural Resource & Environmental Board (NREB) and MBKS Municipal council officials.

The administered open-ended questionnaires were examined to check completeness, accuracy and consistency of responses in order to detect and eliminate errors. The Statistical Package for Social Sciences (SPSS) was used to process the quantitative data. The data were processed into statistical tables and charts for interpretation and discussion. Processed data were analyzed both quantitatively and qualitatively.

Table I: Data collection planning outline

No	*Method of data collection*	*Description*	*Corresponding objectives*
1	Household survey (quantitative approach)	Administration of a questionnaire (235 households selected by stratified sampling.	Public perception, attitude and their expectations towards waste segregation.
2	Interview with local authority staffs (qualitative approach)	Interview on the issues relating to waste segregation practices with NREB and Kuching South City officials.	Current practices adopted. Practical difficulties. Existing legislative support. Existing Infrastructure available.
3	Reviewing documents and reports on waste management (quantitative & qualitative data)	Publications of the Natural Environmental & Resource Board, Danish International Development Assistance (DANIDA) and Kuching South City report.	Waste statistics. Identified waste segregation problems and proposed solutions. Explanations of local authorities for poor waste segregation initiatives.

VI. FINDINGS AND DISCUSSIONS

6.1 Waste Segregation Awareness in Kuching South City

Public awareness and attitudes to waste can affect the population's willingness to cooperate and participate in waste segregation practices. General awareness and information on the social, economic and environmental benefits of the successful practice are important factors which need to be continuously communicated to all sectors of the population. Knowledge is important to predict waste segregation behaviour. Basically increasing knowledge will translate into a change in behaviour. Knowledge of household segregation is about where, what, when and how to practice in a real life [42].

A general question was designed in order to explore the level of awareness of respondents. To the question "Have you heard about waste segregation?" The responses obtained were analyzed and the results shows that 86.3% (196) of the respondents indicated that they have heard the news or in conversation about waste segregation, while 13.7% (31) have never heard of waste segregation. The result indicated that the respondents had adequate awareness on the current waste segregation scenario. Nonetheless, publicity is essential in providing motivation and reinforcing positive behavior. The fact that households have heard about the practice does not guarantee a strong and direct view towards participation and involvement. A broad test of the effectiveness of such publicity aims to find out the source of waste segregation information. Out of 196 respondents that are aware of this practice, the result shows that major news about waste segregation was

sourced through Education from schools (49.8%). However, Municipal leaflet only constitutes 3.2% of the responses, indicating that the existing information/news by the municipality needs to be reviewed with focus on waste segregation. 3.2% of the respondents have heard about waste segregation through friends/neighbors still pointing to the fact that publicity through the municipality leaflet still needs severe improvement. When neighbours are practicing this initiative, there is a tendency for easy passage of this lesson to others neighbours/friends within the vicinity. Hearing the information/news from schools does not guarantee the successful practice, as not all the respondents have access to higher learning.
In addition to the assessment of the publicity on waste segregation in Kuching South City, it is important to identify the awareness of households about the leaflets on waste segregation provided by MBKS. As can be seen in Table II, only 3.2% claimed they have received leaflet from the municipality.

Table II: Communication media on waste segregation

Media	*Percentages (%)*
Education from school	49.6
Municipal leaflet	3.2
Radio/Television	18.1
Newspaper & articles	19.4
Neighbours/Friends	3.2
Others (internet, conference, etc)	6.5

According to the interview with MBKS, several awareness programs have been organized basically in direct dialogue and seminars within the community. The purpose of these programmes was aimed to give the community the privilege to ask direct questions from the MBKS staff regarding the waste segregating practice thus allowing the community to learn the knowledge concerning the waste segregation concept. It was also noted that most of the information regarding this programmes is found on the council's website. Although, this proves to be a good initiative from the municipality council but more attentions need to be directed in their communication media as lowest rate is found in the area of Municipal leaflet and through Neighbors/friends. Municipal solid waste management is meant for the public, and, without the public's cooperation, the system cannot be operated or maintained appropriately. Hence, it is necessary to make the public aware of waste segregation practices through liable communication channel and active participation in the system. In practice, system efficiency is directly proportional to the number of participating citizens for waste segregation. Without the general public participation, it may be difficult to maintain efficient MSWM services, and resource recovery systems may become less effective if wastes are poorly separated at the source. Therefore, to have an effective channel of communication, the media of communication of waste segregation initiatives needs to be bridged and looked into adequately.

6.2 Participation in Waste Segregation in Kuching South City

Source separation also called "in situ segregation of domestic waste" is the sorting out of individual waste types into separate storage containers at the point of generation. From the questionnaire survey, it was revealed that 42.4% (95) of the respondents are separating their waste at their residence while 57.6% (129) do not separate waste at their household. The level of household participation in waste sorting is alarmingly low in the study area. This low participation in waste sorting in the entire sample area could allude to a low level of awareness of environmental issues and low environmental education (formal and informal) which may cultivate into apathy towards waste sorting. However, these further analyses showed that respondent do not have sufficient knowledge on waste segregation. Even though recycling activity in Kuching City is increasing, thus the recycling initiative still needs to be enhanced. The Malaysian's attitude towards waste segregation and recycling is higher, but only few practice it [43].

6.2.1 Limitations to participation in Waste segregation

Concerning the reasons for not practicing waste segregation at respondents residence. Out of 129 respondents who are not practicing source segregation, majority (29.2%) claimed that the lack of facility (see Table III) was their major limiting factor towards this practice. This reason was also mentioned by [30] in a residential area in Subang Jaya, Selangor, Malaysia which shows that the lack of recycling facilities in KLFT and Selangor areas is an inhibitors towards waste recycling. This same reason was also stated by non-recyclers in the study by [44] as "no storage facility" to keep the recyclable items at home. Followed by other variables, such as Inconveniencies (ease of access), no collectors, no interest, not aware, no idea on how it is done, no incentive and no time which constitutes 18.6%, 13.0%, 11.2%, 10.6%, 8.1%, 6.2% and 3.1% respectively.

Table III: constraints towards waste segregation practice

Limitations	*Percentage (%)*
No facility	29.2
Inconveniencies	18.6
No collectors	13.0
No interest	11.2
Not aware	10.6
No idea	8.1
No incentive	6.2
No time	3.1

Generally, those who perceived time used in waste separation as a constraint had a high opportunity cost of time and were thus less likely to sort the wastes. This is in agreement with a number of studies on recycling behavior where time is looked at as an important inconvenience factor [45, 46, and 47]. The reasons for the Inconveniencies in major responses were due to the method of collection as well as problems associated with waste management such as the distance to the recycling bin/ buy-back centres, systematic operations, failure of collection time and odour.

According to the interviews with MBKS, the strongest reason for the low participation in source segregation of recyclables was determined as the ease of access to recycling centers and also the transport of this recyclables to recycling company at the peninsular (West Malaysia). Financial restraints and a limited number of workforces in the process were both assessed as potential reasons with the MBKS Waste Manager. This automatically can lead to households not showing interest in this practice. This is also in line with the finding of [48] whereby lacking awareness and interest create barriers to sustainable behavior.

6.2.2 Households' Motivations in Waste Segregation

For the assessment of the existing efforts done by MBKS, majority of the responses were not favorable, with most of the respondents (89.2%) felt that MBKS had not done enough to encourage and develop waste segregation practices effectively and efficiently in the municipality. What this implies is that most people in the neighbourhood were either unaware of the activities of the local authority towards waste segregation or do not believe they are doing much in terms of promoting waste segregation. On what needs to be done to encourage waste segregation in the study area, 24.3% of the respondents suggested that the Provision of facilities (bins and more recycling centres) within their vicinity would definitely make waste segregation and recycling more convenient (Table IV). This variable has the highest percentage among all the variables. This implies that provision of more facilities and more recycling centres in housing areas/estates will be of a strong encouragement for them to participate in waste segregation. Similarly, most of the households also required the collection authority to pick up their segregated recyclables regularly, preferably on the same day with the conventional solid waste collection. However, this may reflect more effective publicity associated with household waste segregation. Apart from having a separate bins, it is also important that these bins must be made attractive to complement the waste segregation initiative. It was suggested by some households that the design of the recycling centres be changed from the ordinary, dull looking enclosed box type to high visibility type. They also felt that segregating bins should be labeled in all local languages so that residents of various ethnic backgrounds will understand what the receptacles are for and therefore they will not treat segregating bins as ordinary trash bins.

22.5% of the respondents suggested that MBKS should provide more awareness for them. This is pointing to the fact that household see recovery of waste as benefits to the government involved. Households should not only be aware of this practice, they should be as well aware of the social, economic and environmental benefits associated. Likewise 17.5% of the respondents suggested that MBKS should regularly conduct workshop and exhibition on waste segregation, majority of them suggested it to be conducted on weekly basis. This is because lack of knowledge is one of the main reasons why households did not separate their household waste and there should be an ongoing effort to educate those that are not separating at their residents and also reinforce the lessons to those separating at their house.

According to the interview with MBKS, result shows that there are existing recycling activities (such as home composting and buy-back programmes) already in place at the South City. MBKS uses the concept of coupon-based redemption system for its buy-back scheme where the residents get an exchange for recyclables dropped in for household items (such as detergents, toothpaste, toothbrush, Tissue, etc). Even though this programmes seems to be visible and available in recent, yet majority of the respondents seem not be aware of such service which point to the fact that more awareness strategies needs to be inculcated (T.V, newspapers, Municipal leaflets). Among this media, more concentrations needs to be on Municipal leaflets and should be distributed on regular basis.

The percentage of making waste separation mandatory is low (10.4%). Most of the respondents claimed that waste separating activities should be made on voluntary basis as though it is still at its peak in Kuching South City. Those respondents who agreed to laws being enforced were basically aged respondents as they felt it is individuals' responsibility to separate waste at house, that until when there are bylaws, the youths will continue to be ignorant of waste segregation. Few of the households also showed concern towards the introduction of laws as regards the PAYT, that if imposed would not yield good result thus awakening the illegal dumping of waste. This shows that households are not ready to accept this service if imposed. This is due to their increase in financial burden.

Concerning households willingness to separate in the absent of incentives, financial incentives such as tax reduction were perceived a great strategy to increase their uptake.11.7% agreed that Incentives and bonus be given and also increased. Even though this Coupon-based scheme seems encouraging, it still needs to be reviewed and targeted to encourage majority in the City. The impact of incentives as one of the basic factors towards household waste recycling was observed in the study by [46], [44]. This is also streamlined to the fact that majority of the households still see waste recovery as a benefit to the government. Nevertheless, until households start seeing the purpose of waste segregation a benefit to them as well, the participation would still be low. Regular collection of segregated materials at every residence often will definitely make the practice more convenient. However, this will increase the cost of waste management.

Based on the interview with MBKS council, it was noted that there is no national policy on MSWM and in waste segregation. Nonetheless, the ABC has become their de facto guideline for MSWM activities by the State and Local Authorities. The ABC, however, was formulated on the basis that action plans would be executed by the local authorities with guidance from federal agencies. The success of the federal government privatization programmes has shown that the private sector can play a key role in rejuvenating sectors for the economy, which have been retarded when under government control. With the increased participation of the private sector, through privatization, various aspects of the ABC will require amendment. Furthermore, the creation of a new policy for MSWM in Malaysia is important as a part of the legislation approach to support an integrated approach for better MSWM. With the existence of government action to ban materials such as glass, plastic, paper, organics and others to disposal sites, this will encourage the community to practice recycling and composting. When people start to take part in any activities related to waste segregation, recycling and composting, this will be very good strategy for Malaysia in future to decrease the total MSW generation to the disposal site.

Table IV: Motivating factors to participate in waste segregation

Requirements to participate	*Percentage (%)*
Provision of Infrastructure (bins, collections)	24.3
More awareness/campaign be provided	22.5
More Workshop & Exhibition	17.5
Regular collection of separated waste	13.6
Give/Increase Incentives	11.7
Legislation be enforced	10.4

6.3 Influence of demographic factor and regulations on waste segregation in Kuching South City

The following factors were tested for this study;

6.3.1. There is no significant relationship between age, sex, race, education to participation in source segregation.

It is often believed that those that are ignorant to separate their recyclables at home are the older generation. However the result of the correlation test indicates that P>0.05 (see Table V), that is there is no significant relationship between age to participation. This is because age is no barrier towards waste segregating activity.

Likewise this test show insignificant relationship between Sex to participation in waste segregation in Kuching South City. Although some researchers have proved that female tend to be involved in such recycling activities than in male. This result is not in agreement with studies by [49] and [50] who found women more involved in source separation of wastes than men. Therefore there is no condition of sex towards waste segregation at source in Kuching City. Waste segregation can be practiced irrespective of the sex.

Also, this test shows insignificant relationship between race and education to participation in waste segregation. This test prove that waste segregation if well communicated to the household using a simple language can be practiced without necessarily learning it from schools. In summary, household do not need any form of degree/certification and do not need to belong to a particular tribe or ethnic group before they can practice waste segregation.

Table V: Correlation test of age, sex, race and education to participation in waste segregation

Variables	*Pearson's Correlation (r)*	*Sig.(P)*
Age	*-0.055*	*0.607*
Sex	*-0.0233*	*0.739*
Race	*0.081*	*0.242*
Education	*-0.109*	*0.116*

Not significant at P>0.05 level

6.3.1. There is generally a significant difference between waste separators and non-waste separators in respect to their views towards legislation.

The difference between waste separators and non-waste separators on their view towards legislation was determined by conducting an Independent t-test. The result shows a significant value of P<0.05 that is {t (213) = -2.893, P=0.004}. This shows that there is a significant difference in their opinion towards implementation on legislation. However waste separators felt they are participating in this segregating activity because they are aware of the impacts and benefits to the environment and are also supportive towards government initiative. Therefore, they felt making the scheme mandatory for the public would make those that are ignorant of this practice to participate, thereby changing their thoughts and behaviours. They also felt it is individual's responsibility to practice waste segregation towards a better sustainable management system as this process involves recovering the excessive amount of waste disposed to the landfills thus conserving the landfill space. This point to the fact that waste segregators have good knowledge on the social, economic and environmental benefits of waste segregators. The non- waste segregators are not willing to accept laws as they felt practice waste segregation is by choice as it is government's responsibility to manage the environment efficiently without the involvement of the public. Non-waste separators also felt that if laws are impose, it would rather de-motivate those that are contemplating to engage in the practice or those have learnt through friends and neighbours in this practice.

VII. CONCLUSION

In reality, the MSW generation and management cannot be avoided completely as long as humans exist and this issue will always arise simply because societies will continue to generate trash due to increasing populations and the growing demand of modern society [51]. The results support the common assumption that when citizens who are environmentally concerned have bins near to their home, they appear to be willing to recycle more fractions than when they have to walk for a longer time to drop off the waste, due to the inconveniencies [52]. As we have seen in this study, the importance of ease of access to the bins is obviously an incentive to waste segregators. Once more, this is also consistent with the results obtained by [53].

The source separation of the recyclable material can be achieved by increasing awareness among the public. Household support is essential to the effectiveness of any program aimed at recovering recyclables at its source. A well informed and concerned public greatly facilitates program implementation and ensures its success. However, the success of such schemes will depend on the participation rate of households. Also to achieve the objectives of waste segregation scheme, community-based solid waste management has to be sustainable. Active support and involvement of the real estate company and the community residential committee play a crucial role in achieving the fundamental goal of source separation by increasing public awareness and the participation rate. However, the involvement of active environmental organizations, women's clubs, church organizations and other associations is necessary. Generally, campaigns should target both men and women due to the complementary nature of their roles with women more likely to carry out waste separation while men provide the labour necessary in waste management activities like composting which requires more physical effort.

In general, source separation at the household level can only become part of a new waste management policy or bye-law to enhance reuse provided there is Incentive driven initiative for the waste generators, Infrastructures such as (bins, collection centres and regular collections). More also needs to be done in research that would result in a design of convenient in-door bins for the households that will reduce the ease of access limitation from households.

VIII. ACKNOWLEDGEMENTS

The authors' sincere appreciation goes to Universiti Malaysia Sarawak, Institute of Bio-diversity & Environmental Conservation (IBEC), Chief & Mrs. Otitoju, Prof G.T. Olutunla, Deji, Wale, Tope, Ibukun, Taiwo, Seunfunmi, the Households & Municipal Council of Kuching South City (MBKS) and Natural Resource & Environmental Board (NREB) for their support on the success of this study.

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