Management Services for Comparative Assessment of the Municipal Solid Waste

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Abstract: Mankind naturally depends on the environment to sustain their lives but solid waste is one of the three major environmental problems in Nigeria, Malaysia and many other developing and even the developed countries are threatened by this. Waste management generally plays a significant role in the ability of nature to sustain life within its capacity and therefore an integral part of urban and environmental management in every city. Currently municipal solid waste management is a globally challenging issue especially in developing countries, due to its adverse environmental effects. This research is a comparative study aimed at rating municipal solid waste management services in FCT Abuja and Putrajaya towards identifying deficient areas requiring improvements. Residential questionnaire were used for the assessment. The data obtained was analyzed using qualitative and quantitative methods; specifically descriptive, parametric and nonparametric statistics.

Keywords: Assessment, Solid Waste, Management, Rating

1.0 Introduction

Presently the rapid population increase due to urbanization in Abuja metropolitan areas have caused difficulties for the state and local environmental protection in providing an effective and efficient municipal solid waste management system (Olanrewaju and Ilemobade, 2009; Zamorano *et al*., 2009). Urbanization affects land use and when not controlled causes the emergence of illegal structure and neighbourhoods which is characteristic of some areas within and outside the metropolis. This has ultimately affected the city plan, thereby affecting services such as; waste collection, eventually leading to illegal dumping. The management of municipal solid waste has become a major environmental problem, especially for fast growing cities such as the current federal capital; Abuja, with generation amount increasing yearly. Illegal dumps in the middle of residential areas have become common, with odours and rodent. These open dumps cause health risks and reduce the aesthetic value of the surrounding environment, detoriation of the urban environment, as well as contaminate natural resource (Ogu, 2000). The rapid growing waste generation rates and high cost of waste disposal, depletion of landfill space and the problem of obtaining new disposal sites thereby resulting in open dumping are unresolved issues. This makes it difficult for waste management authorities to identify and create solutions (Gomez *et al*., 2009). Even though several policies and programmes have been put in place to manage municipal solid waste, they prove ineffective due to financial and human constraints (Abuja-Citiserve, 2004). It has become a necessity due to the above mentioned to have an overview and analyse the current state and challenges through an assessment.

2.0 Literature review

Tanskanen (2000) developed and applied a computer model to study the integrated municipal solid waste management in Helsinki metropolitan area (Finland). The model was developed for analyzing on-site collection systems of waste materials separated at the source. The study aimed at finding and analyzing separation strategies, fulfilling the recovery rate targets adopted for municipal solid waste in Finland. Chang and Davila (2008) offered a unique municipal solid waste investigation with regard to both physical and chemical characteristics illuminating the necessary management policies with greater regional relevancy. Zotos *et al*., (2009) developed a systematic approach for municipal solid waste management at both the household and non-household level. It aimed at providing a framework in the municipal solid waste management field for municipalities in Greece, as well as other countries facing similar problems. Turan *et al*. (2009) presented a brief history of the legislative trends in turkey for

municipal solid waste management; the study presented the municipal solid waste responsibilities and management structure, together with the present situation of generation, composition, recycling and treatment. Bovea *et al*. (2010) compared from an environmental point of view different alternatives for the management of municipal solid waste generation in a town within Spain. Tunesi in (2010) analyzed local waste management strategic and management planning documents. In the paper three different emerging energy recovery strategies where identified, with each energy recovery strategy resulting in different solutions in terms of technology selection. Ahiamadu (2007) carried out a comparative analysis on various waste management options, with emphasis on the health and environmental impacts of municipal solid waste and the challenges confronting municipal solid waste management in Nigeria. Olanrewaju and Ilemobade (2009) researched on Ondo state integrated waste recycling and treatment project in Nigeria, looking into the issue in terms of municipal solid waste management before and after the introduction of this system. They documented the success of the project in turning waste to wealth. Babayemi and Dauda (2009) evaluated the solid waste generation, categories and disposal option in developing countries. They used Nigeria as a case study; their study results indicated large generation at high rates without corresponding efficient technology to manage the waste. Onwughara *et al*. (2010) studied the issues of road side disposal habit of municipal solid waste in Nigeria. Several studies over the years have been carried out towards addressing these issues, different methods have been applied toward resolving different aspect of solid waste and waste management issues as a whole.

 Framework for MSWM Assessment

Assessment is the process of documenting, usually in measurable terms, knowledge, skills, attitudes and beliefs. This can be subjective or objective and an informal assessment usually occurs in a more casual manner. This may include observation, inventories, checklists, rating scales, performance and portfolio assessments, participation, peer and self -evaluation, and discussion. Tools used in assessment can consist of manuals, guidelines, software's, models and surveys. When selecting an assessment method, the selection should: answer questions that are important, time efficient, cost available and resources effective. Results should give useful feedbacks that highlights efficiencies and identifies areas that are deficient. When selecting an assessment tools/ methods, selection should be based on the tools/methods that will provide the most useful and relevant information for the purposes. Many outcomes will be difficult to assess using only one measure so an integration of two or more methods is recommended (University of Massachusetts Amherst, 2001). The advantages to using more than one method include:

1.   Multiple measures can assess different components of a complex task

      No need to try to design a complicated all-purpose method

2.   Greater accuracy and authority achieved when several methods of assessment produce similar findings

3.   Provides opportunity to pursue further inquiry when methods contradict each other.

All assessment measures do not have to involve quantitative measurement. A combination of qualitative and quantitative methods can offer the most effective way to assess goals and outcomes. Effective methods of assessment provide both positive and negative feedback (University of Massachusetts Amherst, 2001). In this study survey methods is will used to rate the municipal solid waste management services in two cities towards identify deficient areas where improvement is required.

3.0 Methodology

In this study FCT Abuja and Putrajaya are selected as representative of the current solid waste management in Nigeria and Malaysia. The selection is based on the existing situation with different solid waste management problems, size, and challenges (Eriksson, *et al*., 2005; Kumar and Goel, 2009) and being a federal capital of the country it should be a model of excellence for other cities to emulate. This research is a descriptive research using survey method as an assessment tool, in comparative approach. The criteria used for selection of both cities are based on: Both administrative capitals, planned cities and share similarities in land-use patterns. A likert scale questionnaire was used as instrument for the data collection and Validated. The questionnaire was adopted from previous studies with modifications to suite this research. Validity includeed four parts: face validity, content validity, construct validity and criterion-related validity. A survey has face validity if it looks clear and well-organized; this is something a researcher determines before giving the survey to any students or colleagues. A survey has content validity if the questions fall into the area under study; in theory, experts in a given field will agree on what questions belong in that field. A survey with criterion-related validity is directly comparable with other measures of the same attributes. Construct validity, the requirement that the survey actually measures what it is intended to measure, is the most important requirement and the hardest to satisfy. The questionnaire was validated by experts. The questionnaire was tested via pilot study and retested after modifications were made.

The sampling method was selected to enable collection of representative and unbiased samples. Sampling procedure refers to the process of selecting individuals from the target population (Suleiman, 2004). The primary goal is to get a representative sample or small collection of unit or cases from a much larger population, such that

the researcher can study the smaller group and produce accurate generalizations about the population (Neuman, 2003). The residential questionnaires will be distributed using randomized sampling and distributed to households, within public places and parks. In both case studies enumerators were used to assist with the distribution and retrieval of the questionnaires. The enumerators have had academic training in environmental matters and are familiar with conducting surveys (Gomez et al., 2009). Sekaran (2010) proposes that sample size should be larger than 30 and less than 500, which would be appropriate for research purposes. The sample size for the residential questionnaires was calculated from the formula below. This formula has been used to derive an appropriate size for the study area. At 95% confidence level or P=0.05 is assumed for the equation:

$$n = \frac{N}{1 + N(e)^2}$$

Source: (Krejcie and Morgan, 1970; Fox et al., 2009)

Where: n =the sample size, N =the population size; 1,406,239 for FCT Abuja (NPC, 2012) and 72,413 (DOS, 2012), e =the level of precision.

Random sampling method was be used, from the above formula, the sample size will consist of 400 for each case study. Large sample number is also recommended to ensure a higher statistical accuracy and confidence level (UNEP, 2009; Gomez et al., 2009). According to Jacob et al. (1990) a large sample is much more likely to be representative of the population. In other words, the larger the sample sizes the smaller the error and the greater precision of the results (Cohen, 1988). In the pilot study the residential questionnaire n=32 was distributed in FCT Abuja and subsequently analysed to test the instrument. The questions seem too numerous and produced 76 variables. Reliability test was carried by checking of internal consistency using Cronbachs alpha coefficient (Pallant, 2005). The Cronbachs coefficient was 0.62 so the instrument format and scaling was revised re-validated by two experts, and distributed randomly to individual to assess its readability and clearness. The Cronbach coefficient is sensitive to short scales; fewer than ten, then it is quite common to get a low Cronbach value; 0.5 (Pallant, 2005). To achieve objective which is to rate municipal solid waste management services in FCT Abuja and Putrajaya. The variables measured were: overall services, efficiency of services, regularity of services, public awareness, comprehensive laws and enforcement. The data was analyzed using descriptive, parametric and nonparametric statistic

4.0 Results and Discussions
4.1 Demographic Assessment

Gender

In FCT Abuja 55.4% of the population comprises of males and 45.6% females, while in Putrajaya 53.8% comprises of males and 46.2% females. Totally there are 54.1% males and 45.9% females in both cities combine as shown in Figure 4.1. Mann-Whitney U test is carried out to determine if there is a significant difference in the gender distribution when both cities are compared. The results obtained gave a Z value of -0.174 with p=0.862 (Table 4 Appendix 2). Therefore it can be concluded there is no significant difference statistically in the gender category distribution when both cities are compared at a 95% confidence level (CL).

Occupation

In FCT Abuja 59.8% of the population consist of government workers and 40.2% nongovernment workers, while in Putrajaya 40.7% of the population consist of government workers and 59.3% non-government workers as shown in Figure 4.2. When both cities are compared with regards to the distribution based on occupation, using Mann-Whitney U test a Z value of -5.472 is obtained with p=0.000 (Table 5 Appendix 2). It can therefore be concluded the occupation category distribution of the respondents in both cities is significantly different statistically at a 95% CL.

Age Group Distribution

In terms of age group it can be seen from Figure 4.3, Putrajaya has a higher percentage for ages 16-26 at 49.3% compared to FCT Abuja with 12.4%. In other age categories FCT Abuja has a higher percentage of distribution. On further analysis to compare both cities using the Mann-Whitney U test a Z value of -12.135 is obtained with p=0.000 (Table 6 Appendix 2). Therefore it can be concluded with regards to age group distribution both cities are significantly different statistically at a 95% CL.

Number of Individual per Household

From Figure 4.4 it can be seen that FCT Abuja has the highest percentage of individual per household sheltering 9 people and above at 9.8% compared to Putrajaya which has 0.6%. In Putrajaya 2-5 individuals per household is higher than in FCT Abuja. On further analysis to compare both cities using the Mann-Whitney U test a Z value of -6.359 is obtained with a p=0.000 (Table 7 Appendix 2). It can therefore be concluded that the distribution of the number of individual per household differs significantly when both cities are compared statistically at 95% CL.

Level of Education

In FCT Abuja there is a higher percentage of individual with no education at 2.9%, while in Putrajaya 0.5%. Putrajaya has a higher percentage of individuals with secondary education at 19.9% with FCT Abuja having only 9.1%. FCT Abuja has a higher percentage of individual with university education at 67.5%, while Putrajaya has 49.1% as shown in Figure 4.5. On further analysis using the Mann-Whitney U test to compare both cities, a Z value of -4.923 is obtained with p=0.000 (Table 8 Appendix 2). It can be concluded there is a significant difference in the educational level distribution in both cities statistically at a 95% CL.

Total Family Income

In FCT Abuja the majority of respondents total family income is between 100,001 Naira and above; 30.4%, while 8.5% of respondents have a total family income of 20,000 Naira and below as shown in Figure 4.6. In Putrajaya the majority of the respondents; 27.9% have a total family income of 2,001-3,000 RM as shown in Figure 4.7, while 6.2% of the respondents have a total family income of RM 5,001 and above.

4.2 Rating

The rating of the MSWM services Abuja and Putrajaya by respondents was determined. The reliability test carried out to check the internal consistency of the scale (m=23.0395, SD=7.39 and alpha=0.967). The rating are as shown in Figure 1and Figure 2 where in Q1 (FCT Abuja rated average and Putrajaya very good), Q2 (FCT Abuja rated average and Putrajaya rated good), Q3 (FCT Abuja rate average and Putrajaya rated good), Q4 (FCT Abuja rated average and Putrajaya rated good), Q5 (FCT Abuja rated average and Putrajaya rated good) and Q6 (FCT Abuja rated average and Putrajaya good). The lowest score in both cities where for Q4, Q5 and Q6.

Where: Q1; How would you rate the overall municipal solid waste service? Q2; How would you rate the municipal waste service in terms of efficiency of services provided? Q3; How would you rate the regularity of municipal waste collection? Q4; How would you rate municipal waste management services in terms of public awareness programs? Q5; How would you rate municipal waste management in terms of comprehensiveness of existing laws and regulations? Q6; How would you rate municipal waste management services in terms of effectiveness of enforcement of laws and regulation in addressing waste issues in FCT Abuja?

Scale:

0-1; very poor

1.1-2; poor

2.1-3; average

3.1-4; good

4.1-5; very good
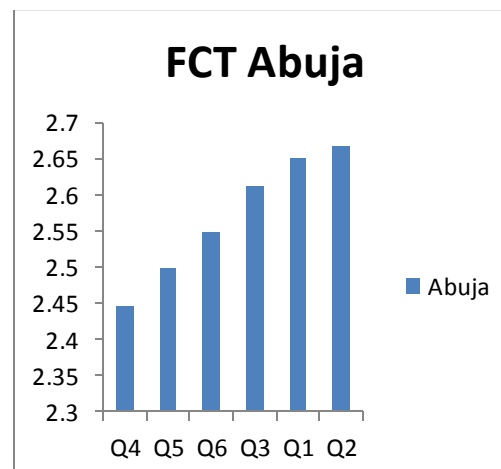
Figure 1: Frequency of respondent rating in FCT Abuja
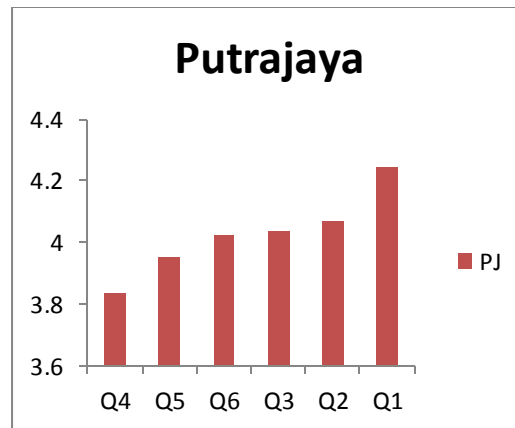
Figure 2: Frequency of respondent rating in Putrajaya

Independent sample T-test was run to determine if the rating of MSWM services between both cities was affected by gender. There were no outliers in the data, as assessed by the results of the Q-Q and box plot graph. The mean scores were normally distributed as assessed by Kolmogorov-smirnov test (p>0.05). To determine if gender influenced the scores of the general assessment, in FCT Abuja the homogeneity of variance was not violated as assessed by Levene's test for equality of variance since p>0.05 (p=0.071), so equal variances was assumed. The male respondents gave a higher score in the assessment (m=2.6696, SD=.74535) compared to females (m=2.4572, SD=.82157), as shown in Table 1 there was a statistically significant difference, m=0.21 at 95% CI (0.06, 0.36), t (2.751), p=0.006.

Table 1: Results for t-test for general assessment against gender for FCT Abuja

Independent Samples Test									
		Levene's Test for Equality of Variances		t-test for Equality of Means					
								95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MEANSCORE. GEN. ASSES	Equal variances assumed	3.266	.071	2.755	412	.006	.21238	.07710	.06083	.36394
	Equal variances not assumed			2.729	379.970	.007	.21238	.07783	.05936	.36541
a. CITY = Abuja										

In Putrajaya the homogeneity of variance was violated as assessed by Levene's test for equality of variance since p<0.05 (p=0.001), so equal variances was not assumed. The male respondents gave a higher score in the assessment (m=4.2281, SD=0.64453) than females (M=3.8157, SD=0.79658), as shown in Table 2 there was a statistically significant difference, M=0.41at 95% CI (0.267, 0.558), t (5.553), p=0.000.

Table 2 : Results for t-test for general assessment against gender for Putrajaya

Independent Samples Test									
		Levene's Test for Equality of Variances		t-test for Equality of Means					
							Std. Error Differen ce	95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Differen ce		Lower	Upper
MEANSCORE. GEN.ASSES	Equal variances assumed	10.972	.001	5.641	387	.000	.41233	.07310	.26861	.55605

				5.553	343.721	.000	.41233	.07425	.26629	.55837

Equal variances not assumed appears in the left cell of the row above.

a. CITY = PJ

Anova was run to determine if the rating of MSWM services between both cities was influenced by age, income and education. In FCT Abuja it can be seen from Table 3, which shows the descriptive statistics for the mean score across age groups, respondents between ages 28-48 gave higher scores in the rating(m=2.711). The results for the anova test in Table 4 shows there is no statistical difference, p= 0.117.

Table 3: Descriptive statistics for the mean score across age groups in FCT Abuja

MEANSCORE.GEN.ASSES

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
16-26	51	2.5327	.87688	.12279	2.2861	2.7793	1.00	5.00
27-37	161	2.5010	.80526	.06346	2.3757	2.6264	1.00	4.83
28-48	135	2.7111	.68724	.05915	2.5941	2.8281	1.00	4.33
49-59	59	2.5395	.82544	.10746	2.3244	2.7547	1.00	4.00
60 and above	9	2.2407	.88235	.29412	1.5625	2.9190	1.00	3.50
Total	415	2.5731	.78602	.03858	2.4972	2.6489	1.00	5.00

a. CITY = Abuja

Table 4: Results of anova for comparison of mean score across age groups in FCT Abuja

MEANSCORE.GEN.ASSES

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.551	4	1.138	1.857	.117
Within Groups	251.231	410	.613		
Total	255.783	414			

a. CITY = Abuja

In Putrajaya it can be seen from Table 5, which shows the descriptive statistics for the mean score across age groups, respondents between ages 49-59 gave higher scores in the rating (M=4.15). The results for the anova test in Table 6 shows there is no statistical difference, p=0.550.

Table 5: Descriptive statistics for the mean score across age groups in Putrajaya

MEANSCORE.GEN.ASSES

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
16-26	198	4.0581	.77893	.05536	3.9489	4.1672	1.83	5.00
27-37	133	3.9975	.73340	.06359	3.8717	4.1233	1.00	5.00
28-48	55	4.0455	.57329	.07730	3.8905	4.2004	2.50	5.00
49-59	10	4.1500	.41164	.13017	3.8555	4.4445	3.67	5.00
60 and above	5	3.5333	1.49722	.66958	1.6743	5.3924	1.00	4.50
Total	401	4.0320	.74238	.03707	3.9591	4.1049	1.00	5.00

a. CITY = PJ

Table 6: Results of anova for comparison of mean score across age groups in Putrajaya

MEANSCORE.GEN.ASSES

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.686	4	.421	.763	.550
Within Groups	218.765	396	.552		
Total	220.450	400			

a. CITY = PJ

In FCT Abuja it can be seen from Table 7, which shows the descriptive statistics for the mean score across education levels, respondents no education gave higher scores in the rating (m=2.875). The results for the anova test in Table 8 shows there is no statistical difference, p=0.423.

Table 7: Descriptive statistics of mean score across education levels in FCT Abuja

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
no education	12	2.8750	.49301	.14232	2.5618	3.1882	1.33	3.17
Primary	8	2.5208	.54509	.19272	2.0651	2.9765	2.00	3.50
secondary	37	2.3919	.92314	.15176	2.0841	2.6997	1.00	4.83
college	77	2.6017	.77429	.08824	2.4260	2.7775	1.00	4.33
University	281	2.5777	.78464	.04681	2.4856	2.6698	1.00	5.00
Total	415	2.5731	.78602	.03858	2.4972	2.6489	1.00	5.00

a.   CITY = Abuja

Table 8: Results of anova for comparison of mean score across education levels in FCT Abuja

MEANSCORE.GEN.ASSES					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.400	4	.600	.971	.423
Within Groups	253.383	410	.618		
Total	255.783	414			
a. CITY = Abuja					

In Putrajaya it can be seen from Table 9, which shows the descriptive statistics for the mean score across education levels, respondents with university education gave higher scores in the rating (m=4.1184). The results for the Anova test in Table 10 shows there is a statistical difference, p=0.046.

Table 9: Descriptive statistics of mean score across education levels in Putrajaya

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
no education	2	3.9167	.11785	.08333	2.8578	4.9755	3.83	4.00
Primary	6	3.6944	.69456	.28355	2.9656	4.4233	3.00	4.83
secondary	78	3.8312	.81848	.09267	3.6467	4.0157	1.00	5.00
college	117	4.0399	.72867	.06737	3.9065	4.1733	1.83	5.00
University	197	4.1184	.71414	.05088	4.0181	4.2188	1.00	5.00
Total	400	4.0321	.74406	.03720	3.9589	4.1052	1.00	5.00
a. CITY = PJ								

Table 10: Results of anova for comparison of mean score across education levels in Putrajaya

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.335	4	1.334	2.444	.046
Within Groups	215.559	395	.546		
Total	220.894	399			
a. CITY = PJ					

In FCT Abuja it can be seen from Table 11, which shows the descriptive statistics for the mean score across income levels, respondents earning between 20,001-40,000 Naira, gave higher scores in the rating, but there were no large differences in the mean score between the different income levels. The results for the anova test in Table 12 shows there was no statistical significant difference; p= 0.446.

Table 11: Descriptive statistics of mean score across income levels FCT Abuja

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Below-20,000	34	2.5196	.83259	.14279	2.2291	2.8101	1.00	4.83
20,001-40,000	70	2.6714	.76031	.09087	2.4901	2.8527	1.00	4.83
40,001-80,000	104	2.6538	.83242	.08163	2.4920	2.8157	1.00	5.00
80,001-100,000	77	2.4827	.68856	.07847	2.3264	2.6390	1.00	4.00
100,001 and above	126	2.5317	.80075	.07134	2.3906	2.6729	1.00	4.00
Total	411	2.5762	.78494	.03872	2.5001	2.6523	1.00	5.00
a. CITY = Abuja								

Table 12: Results of anova for comparison of mean score across income levels in FCT Abuja

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.293	4	.573	.930	.446
Within Groups	250.318	406	.617		
Total	252.611	410			
a. CITY = Abuja					

In Putrajaya it can be seen from Table 13, which shows the descriptive statistics for the mean score across education levels, respondents earning 1,000 and below Ringgit gave higher scores in the rating. The results for the anova test in Table 14 shows there is a statistical difference, p= 0.000.

Table 13: Descriptive statistics of mean score across income levels in Putrajaya

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Below-1,000	74	4.4527	.57769	.06716	4.3189	4.5865	2.50	5.00
1,001-2,000	90	3.7074	.82195	.08664	3.5353	3.8796	1.00	5.00
2,001-3,000	113	4.0000	.80733	.07595	3.8495	4.1505	1.00	5.00
3,001-4,000	58	4.0776	.53459	.07019	3.9370	4.2181	2.83	5.00
4,001 -5,000	42	4.1508	.54575	.08421	3.9807	4.3209	3.00	5.00
5,001 and above	25	3.7800	.64679	.12936	3.5130	4.0470	2.67	5.00
Total	402	4.0311	.74242	.03703	3.9583	4.1039	1.00	5.00
a. CITY = PJ								

Table 14: Results of anova for comparison of mean score across income levels in Putrajaya

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	24.996	5	4.999	10.099	.000
Within Groups	196.032	396	.495		
Total	221.028	401			
a. CITY = PJ					

Comparison was made between FCT Abuja and Putrajaya to determine if there were differences in the ratings for the general assessment of MSWM, using Friedman test. The comparison of the severity of the problem in each city can be determined by the results of the mean ranks. In FCT Abuja Q4; How would you rate municipal waste management services in terms of public awareness programs, Q5; How would you rate municipal waste management in terms of comprehensiveness of existing laws and regulations and Q6; How would you rate municipal waste management services in terms of effectiveness of enforcement of laws and regulation in addressing waste issues in FCT Abuja, had the lowest mean rank as shown in Table 15. In terms of severity or importance these where the top three issues in the general assessment for FCT Abuja.

Table 15: Mean ranks for general assessment in FCT Abuja

Ranks[a]	Mean Rank
How would you rate the overall municipal solid waste service?	3.72
How would you rate the municipal waste service in terms of efficiency of services provided?	3.73
How would you rate the regularity of municipal waste collection?	3.56
How would you rate municipal waste management services in terms of public awareness programs?	3.21
How would you rate municipal waste management in terms of comprehensiveness of existing laws and regulations?	3.36
How would you rate municipal waste management services in terms of effectiveness of enforcement of laws and regulation in addressing waste issues in FCT Abuja?	3.42
a. CITY = Abuja	

When a comparison is made with regards to the importance of the individual issues using Friedman test, there is a statistical difference p=0.000 as shown in Table 16.

Table 16: Results from Friedman test for FCT Abuja

Test Statistics[a,b]	
N	415
Chi-Square	44.682
df	5
Asymp. Sig.	.000

a. CITY = Abuja
b. Friedman Test

In Putrajaya, Q4; How would you rate municipal waste management services in terms of public awareness programs, Q5; How would you rate municipal waste management in terms of comprehensiveness of existing laws and regulations and Q6; How would you rate municipal waste management services in terms of effectiveness of enforcement of laws and regulation in addressing waste issues in Putrajaya, had the lowest mean rank as shown in Table 17. In terms of severity or importance these where the top three issues in the general assessment for Putrajaya.

Table 17: Mean ranks for general assessment in Putrajaya

	Mean Rank
How would you rate the overall municipal solid waste service?	4.04
How would you rate the municipal waste service in terms of efficiency of services provided?	3.57
How would you rate the regularity of municipal waste collection?	3.50
How would you rate municipal waste management services in terms of public awareness programs?	3.05
How would you rate municipal waste management in terms of comprehensiveness of existing laws and regulations?	3.34
How would you rate municipal waste management services in terms of effectiveness of enforcement of laws and regulation in addressing waste issues in Putrajaya?	3.49

	Mean Rank
How would you rate the overall municipal solid waste service?	4.04
How would you rate the municipal waste service in terms of efficiency of services provided?	3.57
How would you rate the regularity of municipal waste collection?	3.50
How would you rate municipal waste management services in terms of public awareness programs?	3.05
How would you rate municipal waste management in terms of comprehensiveness of existing laws and regulations?	3.34
How would you rate municipal waste management services in terms of effectiveness of enforcement of laws and regulation in addressing waste issues in Putrajaya?	3.49
a. CITY = PJ	

When a comparison is made with regards to the importance of the individual issues using Friedman test, there is a statistical significant difference p=0.000 as shown in Table 18.

Table 18: Results from Friedman test for Putrajaya

Test Statistics[a,b]	
N	403
Chi-Square	145.910
df	5
Asymp. Sig.	.000
a. CITY = PJ	
b. Friedman Test	

FCT Abuja and Putrajaya compared using the means scores for the general assessment in both cities as shown in Table 17 using the scale in Table 4. It can be seen differences due exist in the score in both cities but similarities are visible in the ranking of the importance of issues (Table 15 and 17), and means scores shown in Table 19.

Table 19: Comparison of mean score for general assessment in FCT Abuja and Putrajaya

Mean						
CITY	How would you rate the overall municipal solid waste service?	How would you rate the municipal waste service in terms of efficiency of services provided?	How would you rate the regularity of municipal waste collection?	How would you rate municipal waste management services in terms of public awareness programs?	How would you rate municipal waste management in terms of comprehensiveness of existing laws and regulations?	How would you rate municipal waste management services in terms of effectiveness of enforcement of laws and regulation in addressing waste issues in FCT Abuja?
Abuja	2.6499	2.6667	2.6130	2.4460	2.5000	2.5492
PJ	4.2444	4.0693	4.0395	3.8346	3.9531	4.0272

In all cases Putrajaya scored higher scores in the assessment as shown in Table 19, which is reflective of the better MSWMS in the city as compared to FCT Abuja.

5.0 Conclusions

In the rating of MSWM services rating score with regard to individual questions differed in both cities (p=0.000 in Putrajaya and FCT Abuja). When the rating scores where compared between both cities using the mean score (Table 19), Putrajaya had higher mean score than FCT Abuja indicating a better rating of services. In FCT Abuja and Putrajaya Q4, Q5 and Q6 had the lowest mean rank (Figure 1, Table 15 and Table 17) therefore are the issue that had the lowest ratings. It was also determined age did no influence the rating score of the assessment in both cities (Putrajaya, p=0.550 and FCT Abuja, p=0.117), education influenced the rating scores in Putrajaya (p=0.046) but did not influence the rating scores in FCT Abuja (p=0.423) and income levels influenced the rating scores in Putrajaya (p=0.000) but did not influence the rating scores in FCT Abuja (p=0.446).

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