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Households' Willingness to Pay for Improved Municipal Solid Waste Management Services in Kampala, Uganda

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Abstract

The study evaluated households' willingness to pay (WTP) for improved municipal solid waste management (MSWM) services in Kampala and estimated the total revenue and cost recovery that accrued from WTP. The households in each division of Kampala were categorized into three income groups as low, middle and high using the quality of housing in the absence of any other formal way of stratification. A dichotomous choice contingent valuation technique was used to elicit households' WTP, using the open-ended survey format of contingent valuation method (CVM). The logit linear regression model was used to obtain the WTP of the households. 48.1% of households in Kampala were willing to pay for improved MSWM services with a mean monthly WTP of UGX 5,382 (USD 2.91). The minimum WTP amount per month was UGX 100 (USD 0.054) while the maximum was UGX 70,000 (USD 37.84). The total WTP for low, middle and high household income groups, were respectively UGX 45,635,000, 320,411,000 and 643,523,000 (USD 24,667.57, 173,195.14 and 347,850.27) per month giving a total of about 200% of the total requirement for MSWM in Kampala. The factors which influenced WTP significantly were gender ($p<0.001$), in which females were 52% more willing to pay than males, age ($p=0.012$), household size ($p<0.001$), education level ($p<0.001$), income level ($p<0.001$), marital status ($p=0.036$) and migration status ($p=0.045$) of household respondents. However, period lived in the area did not affect the WTP for improved MSWM services significantly ($p=0.372$). At the lowest WTP class average of UGX 500 per month, annual payment per household would be UGX 6,000 (USD 3.24), implying 97% cost recovery with the City government expenditure of UGX 6,190 (USD 3.34) to give the current MSWM service for a household.

Keyword: Household, willingness to pay (WTP), evaluate, elicit, estimate, income-groups, contingent-valuation-method (CVM) and cost-recovery.

Introduction

Kampala district is located in the central region of Uganda as shown on the map in Appendix 1. The City was chosen for the study particularly because of its high population (estimated at 1.5 million in 2008), besides being the major administrative, commercial and industrial center of Uganda. The high population and the associated increase in urbanization and economic activities has made the impact of the society's solid waste very noticeable. The SWM system in Kampala so far has not properly integrated other solutions such as collection, treatment, and supply for re-use, re-processing and final disposal. The system has also not delivered the optimum economic and environmental results for now and has not provided enough room to adapt to future pressures. Landfill spaces are diminishing and there is difficulty in finding suitable locations and getting public approval. Large investments are required for constructing new landfill facilities (KCCa, 2000). The collection, transportation and disposal of garbage in the city is the responsibility of Kampala city council authority (KCCA) and its divisions as mandated under the Solid Waste Management Ordinance (KCCb, 2000) and the Local Governments Act (GoU, 2003). The problem of uncollected garbage is less in upscale residential places such as Kololo, Naguru, Muyenga, Bugolobi, Ntinda and the city centre, occupied by the more affluent members of society. However, most of the un-collected garbage is found in slum areas of the city occupied by the majority poor. This puts the lives of dwellers at risk of environmental and human health related problems such as diseases. The MSWM services in the city are mainly divided into primary and secondary systems. KCCA mainly concentrates on the latter, where it only engages in transportation and disposal to the final disposal site, Mpererwe landfill, shown in Appendix II. The primary system, which is normally at source- households, industries and institutions, are often neglected despite KCCA levying property and utility taxes. KCCA has placed several garbage skips that are emptied approximately once a week. Eventually heaps of garbage pile up around residential areas, street sides and illegal open dumps. The assessment of household WTP for improved SWM services was based on the use values people attach to an environmental good. In economics literature, the total (economic) value people attach to an environmental good is divided into use and non-use values. Use value refers to the benefit people get by making actual use of the good now or in the future and is divided into direct use value, indirect use value and option value. Living in a clean environment is a direct use derived from a better waste management and prevention of some diseases, because of better waste management is the indirect use. The option value is the future (expected) benefit the individual gets from living in a clean city in the future.

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Materials and Methods

Study areas

The study concentrated on the five administrative divisions of the City, (Central, Kawempe, Makindye, Nakawa and Rubaga) shown in Appendix 1. WTP for improved SWM involves demand estimation, and its main determinant was expected to be income. In each division, the households were divided into three income groups of low, middle and high using the quality of housing in the absence of any other formal way of stratification.

Data collection

A systematic sampling technique was used for the next stage whereby every 3rd building in the selected parishes was sampled. A total of 4015 households were sampled from all the five divisions while considering the total projected population and housing in Kampala in 2008 as detailed in table 1 below. The Contingent Valuation Method (CVM), an environmental valuation technique, was used to estimate the value people attach to environmental amenity or services. Since there are no existing markets for environmental goods, people's valuation for these kinds of goods are derived from "hidden" or implicit markets by constructing artificial markets where people are asked to reveal their preferences. The open-ended format of CVM was used in this survey and involved asking the respondent what maximum price they were willing to pay for improved SWM services. This method had the advantage of avoiding starting point biases. But it was characterized by large numbers of non-responses and protest zeros due to the difficulty household respondents faced to pick a value out of the air without some form of assistance (Mitchell and Carson, 1988).

Table 1: The total projected population and housing in Kampala in 2008, the required number of samples at 95% confidence level (CL) and number of samples obtained per division

Division	2008 Population and Housing Projections		Total Land Area (km^2)	Total Number of Parishes	Number of Parishes Sampled	Required Samples at 95% CL	Number Sampled
Central							
Kawempe							
Makindye							
Nakawa							
Rubaga							
Total	**1508100**	**390009**	**163·0**	**99**	**54**	**1911**	**4015**

Source: UBOS, 2007 (for population and housing, total land area and total number of parishes per division)

Estimation of total WTP for the different household income groups

Based on the total projected population and housing in Kampala in 2008 in which there were 390,009 households and an average family size of 3.9 (UBOS, 2007), the WTP for improved MSWM services in Kampala was estimated.

Results

WTP for improved MSWM services

Households were asked whether they were willing to pay for improved MSWM services and the responses from 3969 households were recorded in table 2 below.

Table 2: WTP for improved MSWM in Kampala

Response	Divisions (figures in % of total HHs)					% of total HHs	Total HH Response
	Makindye	**Central**	**Rubaga**	**Kawempe**	**Nakawa**		
Yes							
No							
Total							

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Likelihood estimates for the determinants of WTP (Logit model)

To identify the factors influencing WTP for improved SWM by households, the household responses to the WTP question was regressed against socioeconomic characteristics of the households and the results reported in table 3 below.

Table 3: Determinants of WTP for improved SWM services (Logit model)

Explanatory Variables	Regression coefficient	Stan. Error	Coeff./S.E	p-values
Sex	0.73483	0.29684	2.47551	0·000
Age	0.08905	0.04717	1.88803	0·012
Education	-0.06301	0.03225	-1.95399	0·000
Occupation	0.02061	0.01411	1.46064	0·000
Migration Status	0.20016	0.09707	2.0621	0·045
Marital Status	-0.02072	0.06082	-0.34074	0·036
Period lived	-0.2721	0.05329	-5.10559	0·372
No. of people in HH	0.72989	0.28879	2.52738	0·000

Estimation of total WTP for the different household income groups

Households who were willing to pay for improved MSWM services were further asked how much money they were willing to pay per month and the responses from 1369 households were summarized in table 4 below.

Table 4: Estimated total WTP for the different household income groups

Class boundary	Class mark	Sample distribution		Total HHs willing to pay	WTP for different Income Groups						Total WTP
					Low Income		Middle Income		High Income		
1 UGX	2 UGX	3 No.	4 %	5 No.	6 HHs	7 UGX	8 HHs	9 UGX	10 HHs	11 UGX	12 UGX
Up to 1000	500	478	34.9	65470	46156	23078 000	14011	7005500	5303	2651500	32735 000
1001–2000	1500	351	25.6	48024	12342	18513 000	30351	45526500	5331	7996500	72036 000
2001–4000	3000	73	5.3	9943	318	954000	5220	15660000	4405	13215 000	29829 000
4001–6000	5000	140	10.2	19135	230	1150000	12571	62855000	6334	31670 000	95675 000
6001–10000	8000	155	11.3	21198	85	680000	16153	129224 000	4960	39680 000	169584 000
1000-20000	15000	76	5.6	10505	84	1260000	1681	25215000	8740	131100 000	157575 000
20001-30000	25000	38	2.8	5253	0	0	394	9850000	4859	121475 000	131325 000
30001-40000	35000	37	2.7	5065	0	0	557	19495000	4508	157780 000	177275 000
40001-50000	45000	17	1.3	2439	0	0	124	5580000	2315	104175 000	109755 000
50001-70000	60000	4	0·3	563	0	0	0	0	563	33780 000	33780 000
Total	–	1336	100·0	187595	59215	45635 000	81062	320411 000	47318	643523 000	1009569 000
Mean	–	–	–	–	–	771	–	3953	–	13600	5382

Note that USD 1 = UGX 1852 at the time of data collection (2009).

From the class intervals for the WTP amounts, the class mark (mid-point of WTP amounts) was calculated and the results presented in table 4 (col. 2). The total number of households willing to pay (col. 5) was obtained by taking

the proportion of sample households falling in that boundary (col. 4) and multiplying by the total number of households willing to pay for improved SWM services (48.1% of the total projected households in Kampala in 2008 of 390,009). The number of households in each income group (cols.6, 8 and 10 for low, middle and high respectively) were obtained basing on total proportions (col.4), the stated amounts of WTP for each income group and the total households willing to pay in that class boundary (col. 5). To obtain the WTP for the different household income groups (cols. 7, 9 and 11 for low, middle and high income groups respectively), the number of households in each WTP class boundary of each income group (col. 6, 8, and 10) was multiplied by the corresponding class mark (col. 2). The total WTP (col. 12) was the summation of WTP of the different income groups (cols. 7, 9 and 11) in the different class boundaries (which is the same as multiplying col. 5 and the corresponding class mark in col. 2).

Estimation of aggregate benefits of WTP in total revenue and cost recovery

The aggregate benefits of WTP in total revenue at various prices that households in Kampala were willing to pay was calculated and presented in table 5 below.

Table 5: Estimated aggregate benefits of WTP in total revenue

Class boundary	Class mark	Sample distribution		Total No. of HHs willing to pay	Total WTP	Total HHs willing to pay at least that amount (Cumulative.)			Total revenue
1 (UGX)	2 (UGX)	3 (No.)	4 (%)	5 (No.)	6 (UGX)	7 (No.)	8 (%)	9 (No.)	10 (UGX)
Up to 1000	500	478	34.9	65470	32735000	1369	100	187595	93797500
1001 – 2000	1500	351	25.6	48024	72036000	891	65.1	122125	183187 500
2001 – 4000	3000	73	5.3	9943	29829000	540	39.5	74101	222303 000
4001 – 6000	5000	140	10.2	19135	95675000	467	34.2	64158	320790 000
6001 – 10000	8000	155	11.3	21198	169584 000	327	24	45023	360184 000
10001 - 20000	15000	76	5.6	10505	157575 000	172	12.7	23825	357375 000
20001 - 30000	25000	38	2.8	5253	131325 000	96	7.1	13320	333000 000
30001 - 40000	35000	37	2.7	5065	177275 000	58	4.3	8067	282345 000
40001 - 50000	45000	17	1.3	2439	109755 000	21	1.6	3002	135090 000
50001 - 70000	60000	4	0·3	563	33780000	4	0·3	563	33780000
Total		1369	100·0	187595	1009569 000				

Note that USD 1 = UGX 1852 at the time of data collection (2009).

To make the aggregation, the class mark was utilized to compute total WTP (col. 6) and subsequently, total revenue (col. 10). The demand curve for improved solid waste management was derived from the total HHs willing to pay at least a particular amount (figure 1). The total revenue (col. 10) from WTP a given amount (class mark) was obtained by multiplying the class mark by the corresponding total number of households willing to pay at least that amount (col. 9). The trend exhibited in table 4 (col. 10) is depicted on the graph in figure 2 where total revenue first increased as monthly payment increased and reached a maximum of UGX 360,184,000 when the monthly payment was UGX 8,000 per month. After that it decreased and reached a minimum of UGX 33,780,000 per month at the highest WTP of UGX 60,000 (class mark) due to a small number of households (only 563) willing to pay that amount.

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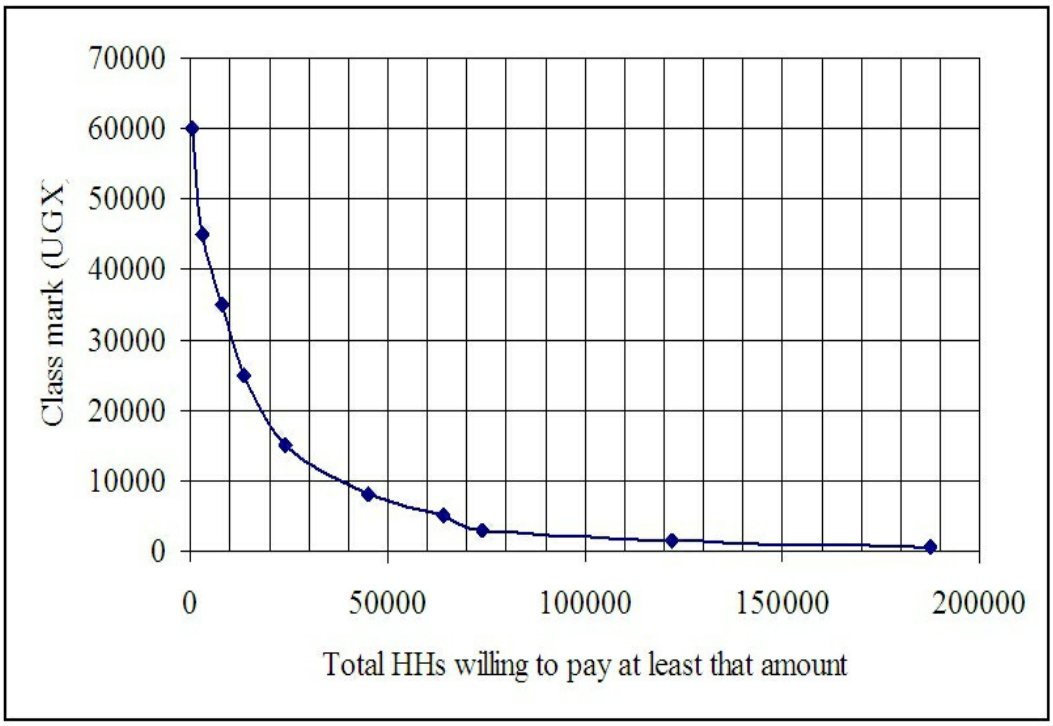

Figure 1: Estimated demand curve for improved MSWM services in Kampala

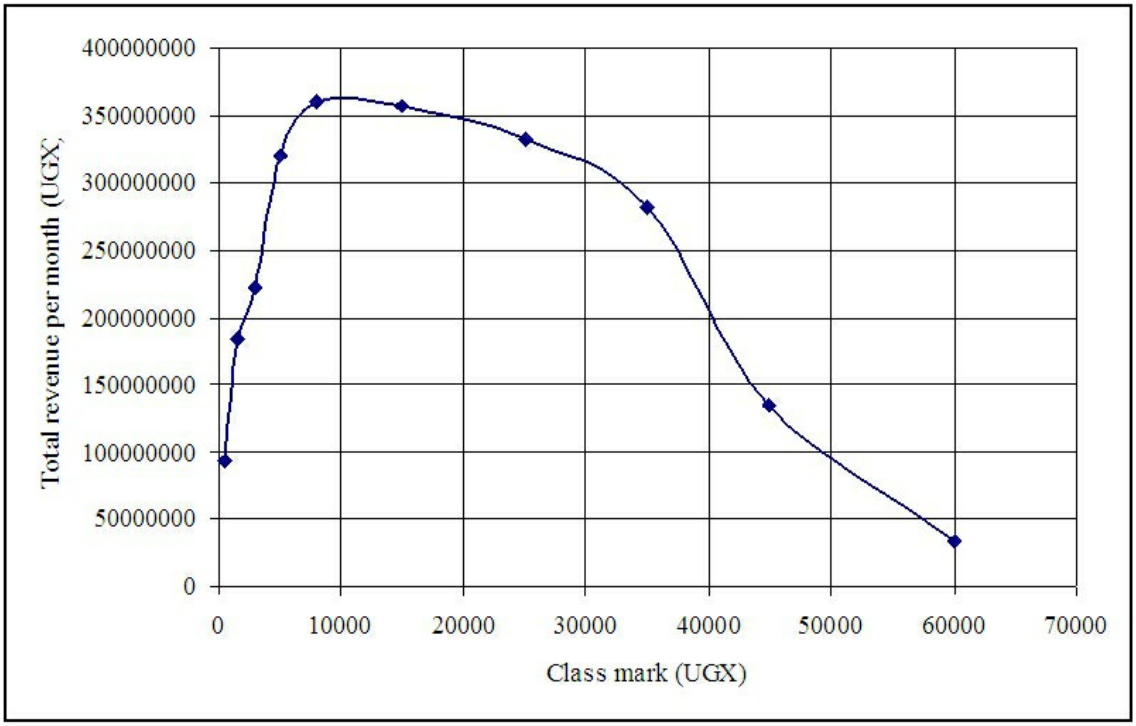

Figure 2: Estimated total revenue from improved MSWM services in Kampala

Discussion

Table 1 revealed that 48.1% of households in Kampala were willing to pay for improved MSWM, the main reason being that MSWM was beneficial to all and therefore should be the responsibility of everybody, while those not willing to pay reasoned that MSWM was the sole responsibility of KCCA and therefore it (KCCA) ought to be responsible. However, WTP for MSWM services in Kampala, being a new practice, attracted a fairly low percentage of households compared to other cities where the practice has been going on. A similar study carried out in Addis Ababa using CVM for elicitation of WTP for improved SWM services revealed that 91% of households were willing to cooperate with government in financing SWM in order to improve their condition (Aklilu, 2002). The results revealed that sex of household respondent affected the WTP significantly ($p<0.001$) and further regression showed that female respondents were 52% more willing to pay for SWM than males. This was probably because traditionally it was the role of women to clean the house and dispose the waste and therefore they bore more responsibility towards SWM in a household. Age of the household respondents affected the

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WTP for improved MSWM services significantly (p = 0.012). The middle age group in the age range of 21 to 60 were found to be more willing to pay for improved MSWM than older ones (above 60) and younger ones (below 20). This was because old people (above 60) considered SWM as government's responsibility while young ones (below 20) just did not feel responsible for improved SWM and were therefore less willing to pay for it. The middle age generation, with big family responsibilities, better understood the implications of poor MSWM and were more familiar with cost sharing and were therefore more willing to pay for improved MSWM services. The education level of the household respondents significantly affected the WTP for improved MSWM services (p<0.001).

The household respondents who had attained secondary, post-secondary and graduate level education were more willing to pay for improved SWM. This was because of the high level of understanding about the desirability of proper management of solid waste. The major occupation of household respondents, which entered the model as a proxy of income, affected the WTP significantly (p<0.001). The business/self employed respondents, public servants and community leaders, who were regarded as employed, were more willing to pay for improved SWM services than the unemployed. This finding confirmed the general agreement in environmental economics literature on the positive relationship between income and demand for improvement in environmental quality. Table 3 also revealed that migration status of the households affected the WTP for improved SWM services significantly (p = 0.045). Further regression revealed that migrants from urban areas were more willing to pay for improved SWM services than those from rural areas.

This was due to the fact that people from urban settings are usually more responsible to keep the environment clean since they understand environmental problems better. Those in rural areas do not see waste disposal as a problem since there is plenty of land to get rid of the wastes. The marital status of household respondents affected the WTP for improved SWM services significantly (p = 0.036). This was due to the fact that married people were more responsible to keep the environment clean compared to single ones because married respondents had larger family size and hence faced higher risks of hygiene associated diseases than those not married. Period lived in the area did not affect the WTP for improved SWM services significantly (p = 0.372) probably because most respondents lived in a particular area only for short periods (less than 5 years) and those who lived longer (more than 5 years) were in the suburbs of the City and MSWM was not much of a problem to them.

The household size significantly affected WTP for improved SWM services (p<0.001). This was due to the fact that the more number of people in the household, the more the waste generated, hence disposal becomes a problem. Households are thus more willing to pay in order to keep a clean environment. In another study carried out in two divisions in Kampala (Nakawa and Rubaga) to establish the determinants of WTP for SWM in Kampala city, the logistic regression estimates revealed that the age of the household head had a negative and significant effect on WTP for SWM (Niringiye, 2010). The results also showed that respondent's level of education, marital status, quantity of waste generated, household size and household expenditure did not significantly influence WTP for waste management.

This was however, noted to be in contrast to earlier findings (Alta and Dehazo, 1996; World Bank, 1995). Another study of the economics of SWM in Uganda also confirmed that the amount to be paid for improved SWM services is influenced by household's income, age, education and gender of the household respondents (EDI, 2010). Table 4 revealed that the mean WTP for improved SWM services for Kampala was UGX 5,382, but varied with the household income groups as follows: UGX 771, 3,953 and 13,600 per month for low, medium and high respectively. The demand curve for improved solid waste management (figure 1) had a negative slope like most economic goods under normal conditions. This implied that increasing WTP had a disincentive effect on the demand for improved solid waste management, keeping all other factors constant. Table 5 revealed that the total WTP were UGX 45,635,000, 320,411,000 and 643,523,000 per month for low, middle and high household income groups respectively, with a grand total of UGX 1,009,569,000 per month (or UGX 12,114,828,000 per year) which the 48.1% of all households in Kampala who were willing to pay for improved MSWM services would pay if the suggested improved solid waste management was to be a reality.

The estimated total revenue increased with the class mark up to a maximum and declined as the class mark increased to a minimum at the highest class mark as depicted in figure 2. In the value for money audit report on SWM in Kampala, carried out by the office of the auditor general of Uganda in March 2010, the amount of money spent on MSWM in Kampala in the financial year 2006/2007 was UGX 2,414,384,558 (OAG, 2010). These were operational costs only, involving garbage collection, transportation and disposal activities for a total collection coverage of 40% (OAG, 2010). This implied that for 100% coverage, the total expenditure for KCC would be UGX 6,035,961,395. The 48.1% of those willing to pay would therefore collect about 200% of the total requirement for MSWM in Kampala per year. From the audited expenditure for MSWM of Kampala for 2006/2007, the City government spent UGX 6,190 per year to give the current MSWM service for a household (OAG, 2010). At the lowest WTP class mark of UGX 500 per month, annual payment from a household would be UGX 6,000, which implies 97% cost recovery. But, this is only if KCCA charges the lowest WTP amount to all households willing to pay for improved MSWM services. And if the different income group areas were to be charged their mean willingness to pay, then the amount collected from a household in low, middle and high income areas with respective mean values of UGX 771, 3,953 and 13,600 per month would respectively be UGX 9,252, 47,436 and 163,200.

This suggests that there is a very wide room for cost recovery by improving the existing service although the values given by households in the survey was not for the existing service but for the hypothetical improvement. A similar study in Addis Ababa revealed that 91% of households were willing to cooperate with government in financing SWM and the mean monthly WTP was Ethiopian Birr 7.07 per month per household, but for the various

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income areas, the mean WTP were Ethiopian Birr 2.96, 7.76 and 13.07 per month for low, medium and high income areas respectively (Aklilu, 2002). A Tobit model regression revealed that income, time spent in the area, quantity of waste generated, education, house ownership, number of children and age of respondent were significant variables in explaining maximum WTP. This study revealed 83.2% cost recovery, suggesting a very wide room for cost recovery by improving the existing SWM services in Addis Ababa (Aklilu, 2002).

Conclusions

Households in Kampala are willing to pay for improved MSWM services (48.1%) ranging from UGX 100 to 70,000 (USD 0.054 to 37.8) per month. Improving MSWM service from its very low current level would not be more costly to KCCA than the current service since households in Kampala are willing to pay for the service. There is a possibility of cross subsidy in case some households are unable or unwilling to pay since the higher class marks are giving higher WTP amounts. There is also a very wide room for cost recovery by improving the existing service.

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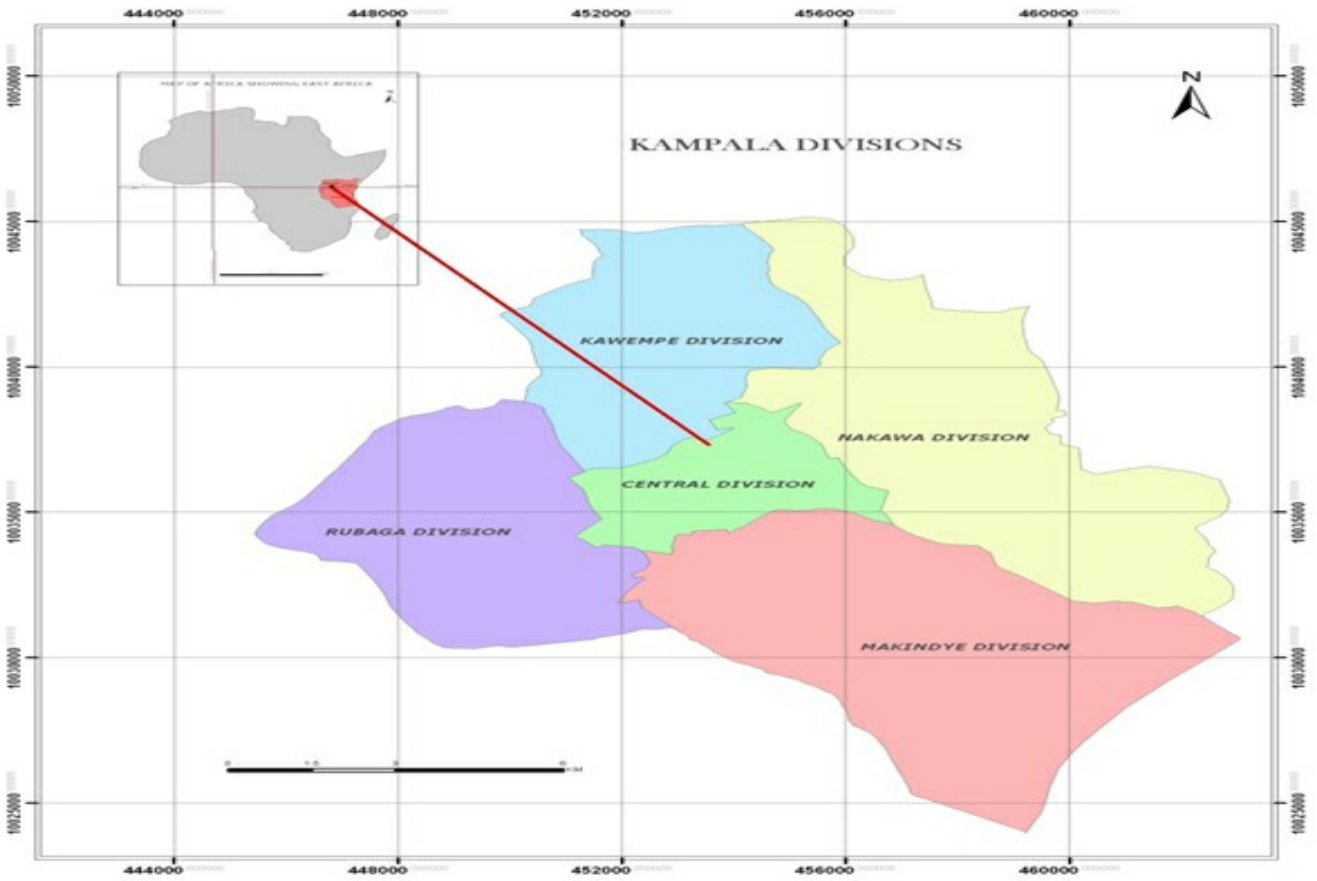
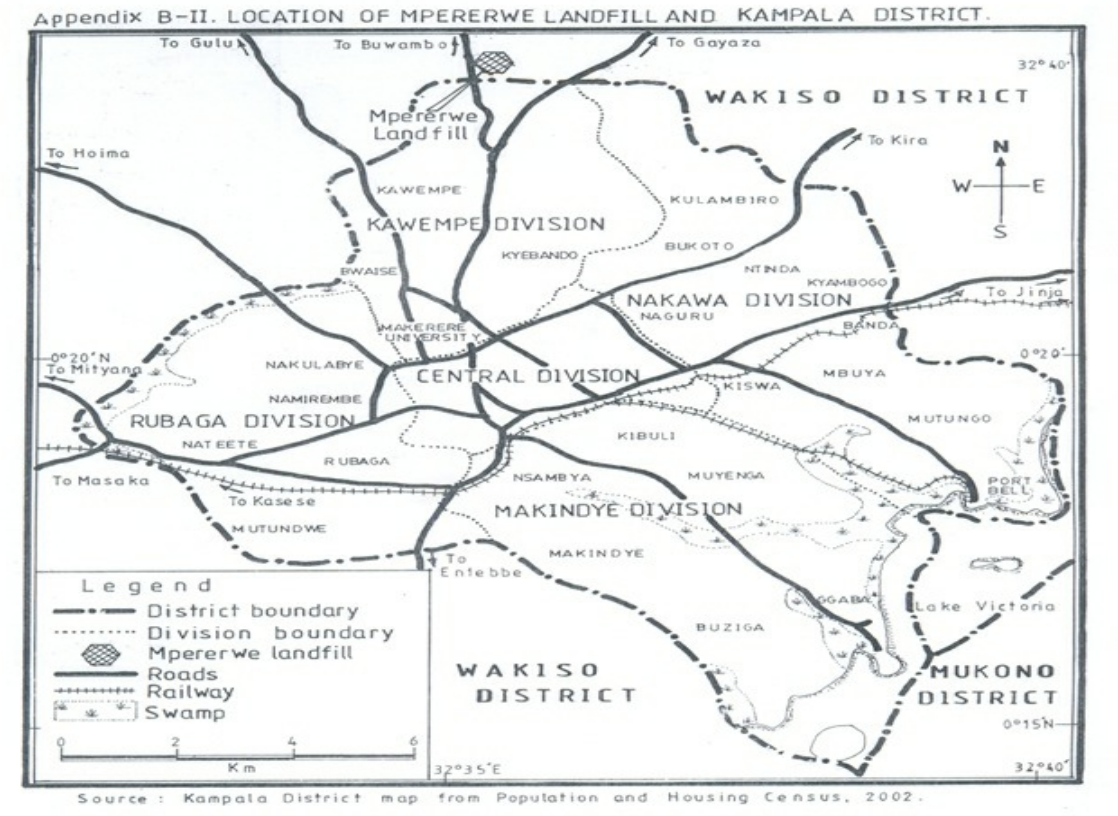
Appendix I



Map of Africa showing location of Uganda and Kampala district administrative divisions (Source: UBOS, 2007)

Appendix II



Map of Kampala and part of Wakiso Districts showing the location of Mpererwe Landfill