

## **Household compliance to solid waste management practices in Masaka city, Uganda.**

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### **Abstract**

Solid waste generation in urban areas around the world is rising at unprecedented rates resulting in serious health, safety and environmental consequences. The situation is more serious in urban of developing countries. This study therefore established factors affecting household compliance to solid waste management practices in Masaka City, Uganda an urban area in a developing country in Africa. This study was further driven by observable persistence littering of solid wastes to some open spaces, streets, non-designated collection centers, drainage channels by some households and would be found with decomposing waste attracting flies and bad odor which rendered the city dirty, non-pleasant to its citizens.

A cross-sectional quantitative approach involving simple random, stratified sampling was used in the selection of the respondents. A research-administered questionnaire was used to collect data from a total of 375 household heads in the central business district.

The results show that only 37.9% of the respondents were compliant to solid waste management practices. And of these the majority were females (xx%) who were married (xx%) and aged below y years (XX%) with some level of education (XX%) and having below 5 members in the household.

The following individual factors: household income [AOR = 1.564, (CI 95% = 1.161 - 2.106), p = 0.003], household size [AOR = 1.716, (CI 95% = 1.195 - 2.464), p = 0.003], house dry waste [AOR = 1.864, (CI 95% = 1.287 - 6.698), p = 0.001], nature of attitude [AOR = 2.893, (CI 95% = 1.750 - 4.781), p = 0.000] and level of awareness [AOR = 2.346, (CI 95% = 1.313 - 4.192), p = 0.004] were found to be significantly associated with compliance to solid waste management practices.

The study therefore recommends that efforts to improve and or achieve better compliance to house hold solid waste management practices, should be focused on the above five social factors and on the individual groupings named above.

### **Keywords**

Solid Waste Management Practices, Household Compliance to Waste Management,

## Introduction and Background

The World Bank reported that waste generation rates are increasing from 2.2 billion tones in 2022 to 3.88 billion tones by 2050 (World Bank 2022). It further reported that at least 33% of the waste currently generated is very poorly managed. Sub-Saharan Africa is generating 174 million tones and only 46% of this waste is collected annually. The resource recovery to solid waste segregation and recycle accounts for 25-66% and between 15 - 20 % in developing countries (World Bank, 2022).

The World Bank (2022) and the WHO (2022) have further reported that urban areas in developing countries are affected by poor waste management including dumping and burning resulting in major negative health and environmental consequences.

In the East African urban areas, several researchers (Abalo *et al.*, 2018; Jenkins, 1993; Dweck *et al.*, 1993, Nyampundu *et al.*, 2020) have reported that the higher income households produce 3 times the waste produced by lower income earners. This therefore, is one of the most important factors in establishing how households comply to waste management.

It has also been reported (Zohoori and Ghani 2017) that uncontrolled solid waste can obstruct water runoff of storm that may lead to flooding eventually resulting into public health and environmental challenges.

In Uganda, Banga (2013) revealed that willingness to segregate household solid waste is 40% while those paying for waste collection believe that this payment should cover segregation at collection and land fill. However, households of high income were reported to be willing to segregate household solid waste and recommended use of enforcement for the success of solid waste segregation as it can significantly be managed at source of waste generation. A more recent study in Uganda by Ssemugabo *et al.*, (2020) reported low household compliance and

that there was persistence littering of solid waste to some open spaces, streets, non-designated collection centers and drainage channels by some households. This had decomposing waste attracting flies and bad odor.

In Masaka City, local authority has provided for litter bins, refuse bankers / skips and collects waste from collection Centers regularly although most of them are not put to common use Whereas some of households and local authorities do practice solid waste management, only 40% waste collection and disposal expose majority (60%) to uncollected waste (MMLG, 2019). In Masaka City, Households are required to have a common point zoned for waste, do daily sweeping, have not less than two waste receptacles, have marked or a description of waste receptacles for both biodegradable (wet) and non-biodegradable (dry), do daily cleaning of a common point zoned for waste, separate biodegradable (wet) from non-biodegradable (dry) waste, Feed animals or chicken with waste food residues, reuse of waste generated, transfer solid waste to council collectors, retain solid waste generated until council collects it, take a duty of on spot watch dog to crude solid waste dumping in any open and respond to monthly day for the village/zone cleanings to keep Masaka clean. However, some households have complied with these responsibilities and some don't, some do sweep and heap leaving solid waste in the open attracting animals that feed on waste and litters when wind blows, finding way into storm water drainage channels and when it rains water stagnate and waste undergoes microbial effects to decompose and emitters bad smells that attract flies and mosquitoes which are public nuisances for disease vectors. The reasons for some households not to comply are not clear which the principal investigator wishes to study.

In August 2018, Masaka urban area launched a self-help up monthly cleanups to keep the city clean and regulate household waste management practices and eliminate waste from streets, in all municipal divisions spearheaded by health department. These measures have had little

impact on waste management practices with some households not adhered to compliance practices. The inadequate compliance is complicated by low sanitary inspection, infrastructure development and community participation (Boateng *et al.*, 2016), exemplified by persistent enteric fevers (MoH Uganda 2020).

Municipal solid waste management is generally improved through existence of relevant policy and improved education on waste management practices especially at household level. This has been reported to include promotion of waste adherence, information on waste generated and managed at households, documentation of solid waste handling practices and amount generated by households with related health outcomes (Owusu-Addo *et al.*, 2016) in Ghana and (Mosler *et al.* 2006) in Cuba.

For Masaka urban area there is no clear information regarding factors that associated with compliance to household solid waste Management practices. This study therefore aimed at establishing the factors associated with compliance of household waste management practices in Masaka City, and the specific objectives were to:

- ) establish the level of household compliance to solid waste management practices in this city
- ) describe the demographic and social factors related to household compliance to solid waste management practices, and
- ) determine the association between factors and household compliance to solid waste management practices in Masaka city, Uganda.

## Literature review

Literature clearly records the poor methods of waste disposal due to increased global population and demand for food and other essentials, which inevitably has been a major source of health hazards including spread of diseases (Pervez and Kafeel 2013, Ssemugabo *et al.*, 2020; WHO

2022; Dauda *et al.*, 2015; Vipin Upapdly *et al.*,2012).

In Kampala, Uganda in the year 2020 it was reported (Ssemugabo *at el* 2020) that only 41.3 % households managed to exhibit proper waste management practices. This is despite the existing national Statutory Instrument Number 40 of 2020 which places the responsibility to the waste generator to safely handle and avoid littering of waste in the environment. The regulation further provides for local authorities to develop and put in place measures to manage waste by waste generators (Government of Uganda 2020).

Masaka city local authority is mandated by the national Renewable Energy Policy for Uganda (2017) to ensure that all households must comply to at least having a common point zoned for waste collections and wet waste placed in different bins from dry waste. But despite this there is still increasing amount of nonsegregated waste in this city.

Fornara *et al.*, (2015) reported that community based solid waste segregation practices were associated with the sense of cleanliness. More recently Nuzrath and Ruzaik (2017) further reported that generally the public perceive that sole responsibility of solid waste segregation is a responsibility of the respective local authority. Though 63% of the respondents had the will to participate in better waste management, a higher percentage (97.8%) were reported to be willing to effectively participate if garbage bins are provided by the local authorities. Many other researchers also raise the issue of various factors being responsible for poor waste disposal in urban areas (Vipin (2012).

## Methods

This was a community based study which used a questionnaire and observational approaches to collect data.

A descriptive, correlation and cross section research designs were employed. Descriptive statistics including frequencies, percentages and the mean was used to establish demographic background of respondents and to ascertain presence of both independent and dependent variables. Correlation analysis was employed to find factors that influence households to comply to solid waste management practices. While regression analysis was employed to establish factors which are strongly associated with households in complying with solid waste management practices.

The study was carried out in the following 3 wards of the central business district of Masaka City: Nyendo Ssenyange, Katwe Butego and Kimanya Kyabakuza.

Masaka City is 125km south of Kampala Capital City Authority along two Trans African highways to Rwanda and to the Democratic Republic of Congo in the south west and also to the United Republic of Tanzania in the south. This city has a population of 123,028 people living in these three wards. This population is involved in both formal and informal businesses and live in a range of several mixed housing standards both registered and non-registered. Therefore, the total number of households is unknown (UBOS 2014).

Using the households as the unit of data collection with an unknown number of households, the sample size consisting of heads of households

above 18 years (found at the household) was calculated using the H. Wiegand, L. Kish survey sampling formula (1968) and determined to be 384. The data so collected was analyzed using SPSS version 20.0

## **Results and Discussion**

Out of the planned sample of 384, only 375 respondents were received representing 97.7% response rate.

The first objective was to establish the level of solid waste management compliance practices among households in this city and was based on compliance and non-compliance. The results show that only 37.9% of the households are compliant. This level of compliance is far less than that reported by Keita (2016) in Guinea, where compliance was 56.2% among respondents who were above 40 years, and 45.9% among respondents aged below 40 years. Masaka city's compliance is lower than the WHO recommended minimum of 50% (WHO, 2022).

The second objective describes the demographic characteristics and social factors of the sample population.

The demographic characteristics which included age, sex, formal education, marital status, household size and household member role were duly established and analyzed (Table 1 below).

**Table 1: Demographic Characteristics of Respondents**

<b>Factors</b>	<b>Frequency (n=375)</b>	<b>Percent (%)</b>
<b>Age Bracket</b>		
< 30	136	36.3
31 – 40	115	30.7
41 >	124	33.0
Mean = 38.3±13.5		
<b>Sex</b>		
Male	127	33.9
Female	248	66.1
<b>Level of Education</b>		
Never went to school	33	8.8
Primary level	85	22.7
Secondary	85	22.7
Tertiary	96	25.6
Graduate	62	16.5
Post graduate	14	3.7
<b>Marital Status</b>		
Married	256	68.3
Not married	119	31.7
<b>Family Size (Adults)</b>		
1 -3	201	53.6
4 -5	122	32.5
6 >	52	13.9
<b>Household Member Role</b>		
Wife	82	21.9
Maid	11	2.9
Any member	192	51.2
Father	22	5.9
Self	55	14.7
Laborer	13	3.4

The results (Table 1) indicate that the majority (67%) of the household were aged 40 years or below, with mean age being 38.3±13.5 years. The majority (66.1%) of the respondents were females. Among the respondents only 44.8% had tertiary level of education while the majority (68.3%) were married. The study also established that the majority (53.6%) of household had a family size of 1-3 members only.

The majority (51.2%) of the respondents reported that any member of the household could handle the solid wastes.

The social factors included level of income, attitude, perceived consequences, awareness, amount of waste generated and the type of solid waste. The results are indicated in Table 2 below.

**Table 2: Social Factors of Respondents**

<b>Factors</b>	<b>Frequency (n=375)</b>	<b>Percent (%)</b>
<b>Income</b>		
< 250,000	313	83.5
250,000	62	16.5
<b>Attitude</b>		
Negative	224	59.7
Positive	151	40.3
<b>Perceived Consequences</b>		
High	355	94.7
Low	20	5.3
<b>Level of Awareness</b>		
Low	111	29.6
High	264	70.4
<b>Amount of Waste Generated</b>		
<i>Wet Waste</i>		
<35kg	311	82.9
36-40kg	43	11.5
41-45kg	17	4.5
>46kg	4	1.1
<i>Dry Waste</i>		
< 7kg	282	75.2
9 -15kg	55	14.7
16 -20kg	33	8.8
> 21kg	5	1.3
<b>Type of Solid Waste</b>		
Food and green	272	72.5
Plastic /polythene	96	25.6
Paper /cardboard	3	0.8
Glass	3	0.8
Residues	1	0.3

Results in Table 2 above show that on income the majority (83.5%) of the households reported earning less than 250,000 Uganda shillings per month. 59.7% reported having a negative attitude towards waste management practices. The respondents believed that having specific corner/zone selected for solid waste handling at household is not a good practice, did not believe in daily cleaning of household by sweeping, did not agree with having a description or marked containers / sacs for solid waste known by members of the household, nor did they believe in having separate containers for solid waste types generated at household, among others.

A majority (94.7%) of the respondents (Table 2) have a very high perceived consequence of solid waste management practices. At the same time the majority (70.4%) had high level of awareness on solid waste practices. Concerning amount of waste generated at household levels, the majority (82.9%) reported generating less than 35 kilograms of wet solid waste on a weekly basis and 75.2% reported generating less than 7 kilograms of dry solid waste per week. However, less than 2% of the households generated above 46Kgs of biodegradable waste and above 21 kgs of non-biodegradable waste per week.

On types of solid waste generated (Table 2) the majority (72.5%) reported that it was food (including food residues) and green (plant) and 25.6% of the households generated plastics materials.

To establish the association between demographic characteristics and social factors with solid waste

management compliance practices among households and since there could be confounding factors, a multivariate logistic regression was performed, to determine the Adjusted Odds Ratio (AOR) and its statistical significance. These are presented in Table 3 below.

**Table 3: Multivariate Association Between Demographic Characteristics and Social Factors with Solid Waste Management Compliance Practices Among Households**

Variable	Compliance to House hold Waste management		COR (95% CI)	p-value	AOR (95% CI)	p-value
	Non-Complaint n (%)	Complaint n (%)				
<b>Sex</b>						
Male	67 (52.8)	60 (47.2)	<b>0.552[0.356-0.854]</b>	<b>0.008</b>	0.712[0.423 - 1.197]	0.200
Female	166 (66.9)	82 (33.1)	1		1	
<b>Marital status</b>						
Married	145 (56.6)	111 (43.4)	<b>0.460[0.285-0.742]</b>	<b>0.001</b>	0.623[0.350 - 1.108]	0.107
Un-married	88 (73.9)	31 (26.1)	1		1	
<b>Household Income</b>						
< 250,000	209 (66.8)	104(33.2)	1		1	
250,000	24(38.7)	38(61.3)	<b>2.153[1.658-2.796]</b>	<b>0.000</b>	<b>1.564[1.161 - 2.106]</b>	<b>0.003**</b>
<b>Household Size</b>						
1 - 3	149 (72.1)	52(25.9)	1		1	
>4	84(48.3)	90(50.7)	<b>3.370[1.990-4.737]</b>	<b>0.000</b>	<b>1.716[1.195 - 2.464]</b>	<b>0.003**</b>
<b>Household dry waste per week</b>						
< 7kg	198 (70.2)	84 (29.8)	1		1	
9 -15kg	19 (34.5)	36 (65.5)	<b>0.106[0.012-0.966]</b>	<b>0.047</b>	1.864[1.287- 2.698]	0.001
16 -20kg	12 (36.4)	21 (63.6)	0.461[0.048- 4.419]	0.502	1	
> 21kg	1 (20.0)	4 (80.0)	0.417[0.042- 4.178]	0.457	1	
<b>Nature of Attitude</b>						
Negative	166 (74.1)	58 (25.9)	1		1	
Positive	67 (44.4)	84 (55.6)	<b>3.588[2.314-5.564]</b>	<b>0.000</b>	<b>2.893[1.750 - 4.781]</b>	<b>0.000**</b>
<b>Level of Awareness</b>						
Low	85 (76.6)	26 (23.4)	1		1	
High	148 (56.1)	116 (43.9)	<b>2.562[1.551-4.233]</b>	<b>0.000</b>	<b>2.346[1.313 - 4.192]</b>	<b>0.004**</b>

**\*\*Significant at 5% level**

**RC=1**

Among the demographic characteristics only household size was significant (Table 3). The households complying to solid waste management practices was two times more likely not to comply compared to those with 1 to 3 persons. These results are supported by Buba (2016) in Nigeria who recognized that household size has an influence on the amount of waste generated; whereby the researcher argued that different populations densities have influence on solid waste generation, collection and disposal.

Among the social factors considered in the study, household income was found to be significantly affecting compliance to solid waste management. The households whose average monthly income was above 250,000 Uganda shillings were found to be 2 times more likely to comply compared to those whose average monthly income is less than shs 250,000/=.

The results are supported by Haile T *et al.*, (2011) in Ethiopia who documented that households whose average monthly income was less than or equal to 3,000ETB (Ethiopian currency) were 50% times less likely to manage their solid wastes compared to those whose income was greater than 3,000ETB. Afroz *et al.*, (2011) documented that middle household income earners above TK 3000 had willingness to minimize waste than lower income earners in Dhaka city Bangladesh. Household income is certainly one of the factors that significantly affect waste minimization practices.

The amount of waste generated (Table 3), indicate that household dry waste generated per week was statistically significant. This implies that households who generated above 9kgs per week were about twice higher likely not to comply to waste management practices than households who generated less than 9 kgs of dry waste. The results were similar to Banga (2011), who reported that in Kampala, 59.4% of households who comply to household solid waste management practices do so because it has a financial motive attached.

Table 3 above further reveals that nature of attitude was statistically significant. This suggested that household positive attitude towards

solid waste management practices were about three times higher compared to those with negative attitude. This observation is supported by Mensah I (2020) who acknowledges that poor environmental sanitation is partly, attributed to the individuals' attitudes towards waste disposal. Zhuang *et al.*, (2008) also agrees and emphasizes public participation.

Finally results in Table 3, show that the level of awareness was statistically significant to compliance and those with high level of awareness were about two times more compliant than those with low awareness levels. The study findings agree with several researchers (Laabar *et al.*, 2017, Maina B, 2016) who have reported that, respondents from the study who were not aware about solid waste management practices had the highest odds of non-compliance to solid waste management than those who were aware.

## Conclusions and Recommendations

In conclusion this study finds that there are relatively low levels of compliance to household solid waste management practices in Masaka city Uganda. Household size and dry solid waste produced per week are strongly associated factors to low levels of compliance. Also, high household income and a positive attitude were strongly associated to high levels of compliance to solid waste management practices.

There is need to establish ways of improving household incomes and attitudes among the households in Masaka City by both the local leaders and the administrative staff of the city.

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