

2016

Demand for, Awareness on and Constraints to Proper Solid Waste Management in Njoro Division, Nakuru, Kenya

Shivoga, W. A.

MMUST

<http://hdl.handle.net/190/257>

Downloaded from DSpace Repository, DSpace Institution's institutional repository



Demand for, Awareness on and Constraints to Proper Solid Waste Management in Njoro Division, Nakuru, Kenya

J. M. Kariuki^{1*}, W. N. Moturi², W. A. Shivoga³, I. W. Kingori⁴ and C. M. Kilonzi²

¹*Department of Environmental Studies and Resource Development, Chuka University, 109-60400, Chuka, Kenya.*

²*Department of Environmental Science, Egerton University, Kenya.*

³*Faculty of Science, Masinde Muliro University, Kenya.*

⁴*Department of Psychology, Counselling and Educational Foundation, Laikipia University, Nyahururu, Kenya.*

Authors' contributions

This work was carried out in collaboration between all authors. Author JMK designed and carried out the study. Authors WNM and WAS supervised the design and the study. Authors IWK and CMK assisted in write up and proofreading. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JSRR/2016/25844

Editor(s):

- (1) Masum A. Patwary, Geography and Environmental Science, Begum Rokeya University Rangpur 5400, Bangladesh.
(2) Leszek Labeledzki, Institute of Technology and Life Sciences, Kujawsko-Pomorski Research Centre, Poland.

Reviewers:

- (1) Surabhi Srivastava, University of Kwazulunatal, Durban, South Africa.
(2) Matheus Poletto, Universidade de Caxias do Sul, Brazil.
(3) V. Sivamurugan, University of Madars, India.
(4) Gina Rizpah Besen, University of São Paulo, Brazil.

Complete Peer review History: <http://sciencedomain.org/review-history/15005>

Original Research Article

Received 22nd March 2016

Accepted 31st May 2016

Published 13th June 2016

ABSTRACT

Aims: The aim of the study was to determine the demand for waste collection services, awareness on solid waste management and constraints to proper waste management for the community within and around Egerton University, Njoro Campus.

Study Design: The research design was a cross-sectional survey whereby data was only collected once from the respondents.

Place and Duration of Study: The study was carried out in Njoro and Mukungugu sublocation within Njoro location, Njoro division in Nakuru County, Kenya in the period January to December 2009.

Methodology: A sample of 220 was drawn from students, tenants, farmers and the business people from within Egerton University and the community around it. A proportionate stratified and systematic sampling design was used. Structured questionnaires were used in data collection whereas analysis was by descriptive and test statistics by use of the statistical Package for Social Sciences.

Results: Only 3.7% of the respondents reported paying to have their waste collected and disposed while about 40% of those not currently paying were willing to start paying. Only age had a significant influence on amount of money respondents were willing to pay for waste collection while income, education level and awareness did not. The study established that awareness was generally low although it was significantly higher for the population within the University ($t=3.594$, $d.f.=218$, $p<0.001$). The main constraints identified were inadequate knowledge/awareness on proper waste management, irresponsibility and lack of disposal sites.

Conclusion: It was concluded that there is need for improved waste management in the area which can be done by developing a waste management strategy for the area, more engagement of the informal sector in waste management and sensitisation of the community on sustainable waste management.

Keywords: Solid waste; waste collection; willingness to pay; awareness; Egerton University; Njoro.

1. INTRODUCTION

Waste collection cannot be rendered without financial resources as someone must pay for labour, resources and time invested in offering the service. In developing countries total coverage of the urban population with efficient waste services is yet to be achieved. Sembiring and Nitivattananon [1] state that in cities in developing countries rapid population growth, urbanization, and lack of resources to provide good waste management services lead to insufficient waste collection, open dumping, and the piling up of waste on the streets and in the rivers. Urban areas are usually served by the local authorities however, in areas not served, it has been noted that informal waste handlers come in to offer the services [2], usually at a fee and also for the income generated from the sale of recyclables. Wilson et al. [3] similarly states that in a number of countries, the informal sector provides waste collection services where there are no formal services, but still makes money from the sale of collected materials. Asim et al. [4] reported that in Lahore, Pakistan, informal waste collectors collect about 80% of the households at a fee and recover about 21.2% of the waste for sale to recyclers. In Dar es Salaam city, Tanzania, about 11% of the waste is recycled with the involvement of about 600 scavengers [5].

The informal sector has been said to increase the willingness to pay for waste services by providing more flexible services and inexpensive features [6]. Before offering waste collection services, it has been noted that it is important

that the ability and willingness to pay for waste collection services should be established. Klundert and Muller [7] recognised that the ability and willingness to pay for waste collection are limiting factors that need to be analysed prior to offering the service and even during its operation if customer behaviour appears to change which may require a revision in the type of service or its price.

While it is ideal to conduct a willingness to pay survey prior to offering waste services, it is difficult to predict the actual willingness before the service is offered. Cointreau-Levine and Coad [8] states that "Until people actually receive a service, they are not able to predict accurately how much they would be willing to pay for it and for this reason, willingness-to-pay surveys need to be conducted both prior to and after the start of the waste collection service". If collection services are already being offered, the quality of the services may be a factor in the residents' willingness to pay with Korfmacher [9] reporting that a successful collection system could increase confidence and willingness to pay. Taylor [10] avers that willingness to pay is directly related to the reliability of the service. Income of residents is an important factor which influences the willingness to pay for waste services, as JICA [11] noted, as income levels rise, the quantity and type of waste will change, and so will the residents' expectations for the quality of solid waste management (SWM) service and their willingness to pay. The willingness to pay for waste collection by poor people is usually low and according to Coad [12] to overcome this limitation, service to poor customers is cross-

subsidised, using surplus income from prosperous areas to support operations among low-income residents.

Awareness on proper waste management is expected to lead to better waste management since it may influence attitudes and behaviours positively. Doan [13] recognise lack of awareness as a great impediment to proper waste management and on the public health effect of urban waste in many regions. In contrast, Desa, Kadir and Yusoff [14] found that people with high awareness levels on SWM had negative attitudes on waste management. Meyer [15] reported that many studies have shown that education, which influences awareness, promotes pro-environmental behaviour while many other studies find no significant influence of education on environmental behaviour.

The study area comprised of two major types of respondents whose access to waste services differed: respondents within the Egerton University where waste collection services were offered and respondents outside the University where the services were missing. The community outside the University was rapidly expanding due to the ever increasing number of students unable to find accommodation in the University, resorting to live outside, the increasing University workers living outside and the mushrooming businesses. Since the year 2008, University admissions in Kenya were freed from pegging admission on bed capacity in University, resulting to thousands of University student seeking accommodation in neighbouring communities. In the study area, this resulted to unplanned growth, giving rise to a highly congested community not served with waste services. The study aimed to find out the existing demand for waste collection services in the area, the level of awareness on sustainable SWM and existing constraints to proper waste management.

2. RESEARCH METHODS

2.1 Study Area

The study was carried out in Njoro Division (about 313.6 km²) of Njoro District to the South-west of Nakuru town [16]. The population under study occupied Njoro and Mukungugu sub-locations which included the population within Egerton University and around the University. The villages around the University that were part of the study comprised Mukungugu, Beeston, Mwigito, Eriithia, Njokerio and Ng'ondou. Njoro

town is the nearest relatively large urban centre to the University at only five kilometres away while Nakuru town, the fourth largest town in Kenya at about 25 Km away. Since Universities' admissions was delinked from bed capacity in the University, the student enrolment in Kenya's Universities increased substantially by an average rate of 25% from 2009 to 2014 (Table 1). In the study area, this population growth led to massive construction of accommodation facilities to take advantage of the ready market. Further, as the expansion was not planned, the result was a congested settlement, which continues to expand, although it is not served by waste collection services. However, waste collection services have been in existence within the University.

Table 1. Enrolment in Kenyan universities (2008-2014)

Year	Total enrolment ('000)	% change
2004 ¹	91.5	
2005 ¹	92.3	0.87
2006 ¹	112.2	21.56
2007 ⁺	118	5.35
2008 ⁺	122.8	3.89
2009 ⁺	177.7	44.71
2010 ^{''}	181	1.86
2011 [*]	218.6	20.77
2012 [*]	251.2	14.91
2013 [*]	361.4	43.87
2014 [*]	443.8	22.80

Sources: ¹17; ⁺18; ^{''}19; ^{*}20

2.2 Research Design and Sampling

The research design was a cross section survey with the sample comprising tenants, students, farmers and businesses. The farmers were only found outside the University. The sampling unit for tenants and farmers was households whereas for business enterprises it was business entrepreneurs. Proportionate stratified and systematic sampling design was used. The shopping centres where most businesses were located were Kwa-Wright, Egerton Gate, Beeston and Njokerio centres. When sampling University students, the halls of residence were purposely selected but the rooms within the halls were randomly selected. The sample size used was 220 based on Kathuri and Pals [21] recommendation that in survey research a major subgroup of the sample could be adequately represented by 100 cases and a minor subgroup by 20-50 cases. Therefore, the strata made up the sample as follows: 80 businesses, 80

tenants, 30 farmers and 30 students. When determining the amount to pay for waste services, students were excluded, as they were dependents and were regarded not to be earning an income.

2.3 Data Collection, Processing and Analysis

A structured questionnaire were used to collect data. The questionnaire had various sections each with a specific focus. Section A comprised the bio-data where the respondent details were taken like age, gender, occupation, income, marital status, family size among others. Section B had items to establish the demand for waste services for instance, presence of waste collection, amount paid for collection, willingness to start paying for services, amount willing to pay, preferred mode of payment for the service etc. Section C aimed at establishing the awareness level of the respondents on waste management for instance attendance of seminars, knowledge of the goals of sustainable waste management, participation in clean-up activities, use of multiple-use (durable) shopping bags etc. Section D aimed to establish the constraint faced in waste management that is, the major challenges that prevented the achievement of sustainable waste management.

In analysing awareness, each indicator that received a positive response was awarded a score of 1 whereas a negative response had a score of 0 which allowed for the calculation of mean awareness, the generation of awareness levels and the calculation of percent awareness which was important by itself and for further analysis. After data collection; data coding, entry and cleaning was done followed by analysis using the Statistical Package for Social Sciences. The analysis was achieved using descriptive statistics and by the test statistics: chi-square tests, t-test test and linear regression.

3. RESULTS

3.1 Socio-economic Characteristics

The results of the study were organised by area of residence within the study area. The population within the University had higher levels of education (74.7% reporting at least college education) than the population outside (15% with at least college education) (Table 2). Equality of gender representation was exactly achieved with

respondents within the University whereas in the population outside 58% of the respondents were males. The population in the University was comparatively younger with the eldest being at most 50 years whereas 8.8% of the population outside the University was more than 50 years. Association of education level and the two populations was significant ($\chi^2=86.186$, d.f=6, $p<.001$) but association with age was not.

The population within the University (students excluded) earned significantly more than the population outside the University ($p<0.001$) (Table 3).

3.2 Awareness of Proper Waste Management

For all indicators used in estimating awareness, the results indicated higher awareness within the University as compared to respondents outside the University (Table 4). For instance, more from the University reported to have attended training event/seminars, to know of and participate in clean-ups activities held in the neighbourhood, were members of environmental groups, were aware of the goals of waste management (reducing, reuse and recycling), carried their own shopping bags and had knowledge on the impacts of improperly managed solid waste.

The mean awareness for all respondents was 2.74 (39%), 3.23 (46%) within the University and 2.52 (36%) outside the University (Table 5). Significance of difference between the means was determined by a t-test.

The test revealed that there was a significant difference in awareness between the two populations ($p<0.001$ at $\alpha=0.05$) whereby the mean awareness of the respondents within the University was higher.

3.3 Payment for Waste Collection and Willingness to Start Paying

Most of respondents (96.3%) reported that they did not pay to have their wastes collected and only 3.7% paid. For those currently paying, the mean average amount paid per month was 275 shillings, ranging from KSh 50 to 500. Within the University, no respondents (0%) reported paying for the waste as compared to 4.7% from outside the University who were paying. Those not currently paying were asked to state whether they would like to start paying for waste

collection whereby 36.3% were willing to start paying a mean average of KSh 302 per month ranging between KSh 20 and 1000. More respondents outside the University were willing to start paying (43.7%) as compared to respondents within the University (19.4%) with

the association between the two populations on one hand and willingness to start paying on the other being significant ($\chi^2=6.609$, d.f.=1, P=.01) (Table 6). In aggregate, the currently paying for waste collection and those willing to start paying made up 40% of the respondents.

Table 1. Characteristics of the study population

Education	Within university		Outside university		Significance
	F	Valid %	F	Valid %	
Illiterate	1	1.5	2	1.4	$\chi^2=86.186$, d.f.=6, p<.001
Primary dropout	1	1.5	8	5.5	
Primary	1	1.5	39	26.9	
Secondary	14	20.9	67	46.2	
Secondary dropout	0	0	4	2.8	
College	5	7.5	13	9.0	
University	45	67.2	12	8.3	
Total	67	100.0	145	100.0	
Sex					
male	35	50.0	87	58.0	-
female	35	50.0	63	42.0	
Total	70	100.0	150	100.0	
Age					
<20	4	6.8	12	8.1	$\chi^2=8.366$, d.f= 5, p=.137
20-30	30	50.8	65	43.9	
30-40	19	32.2	38	25.7	
40-50	6	10.2	15	10.1	
50-60	0	0	13	8.8	
>60	0	0	5	3.4	
Total	59	100.0	148	100.0	

Table 2. Mean monthly income

Respondents	N	Mean	Std. deviation	SEM	Significance
Within university	23	30,021.74	32,502.964	6,777.34	t=3.436, d.f = 140, p<0.001
Outside university	119	6,665.97	5,803.407	531.997	

Table 3. Estimating awareness on proper waste management

Indicators	% of positive responses	
	Within university	Outside university
Training/seminars attended	26	16
Knowledge of clean-ups held in locality	50	39
Participation in clean-ups	44	26
Membership to environmental groups	14.3	13.3
Knowledge of goals of SWM	34	23
Carrying of shopping bags	59	51
Knowledge (effects of SW)	96	81

Table 4. Awareness of respondents within and outside university

Respondent	N	Mean±SEM	Mean (%)	Significance
Within university	70	3.23±0.17	46	t=3.594, d.f.=218, p<0.001
Outside university	150	2.52±0.11	36	
Aggregate	220	2.74±0.10	39	

Respondents willing to start paying were ranked based on the amount of money each was willing to pay per month. The categories were: Low (KSh <300), Average (KSh 300-600) and High (KSh >600) (Table 7). It was found that most of the respondents (62%) were willing to pay at most KShs 300.

A multiple linear regression was run to determine the influence of the variables: Age, education level, income and awareness on the amount the respondents were willing to pay for waste collection. It was found that the model was significant (F= 2.688, P=.045) however, the model could only explain 13.8% of the variability in the dependent variable (Table 8). Only age had a significant influence on the amount to pay (t=-2.604, P=.01).

A chi square test (Table 9) tested association between willingness to pay on one hand and education and awareness levels on the other. The results found no significant association.

3.4 Constraints to Proper Waste Management

In the study area, only within the University was there waste collection but the services were missing in the neighbouring community where no formal or organised informal service was identified. In rental estates, most landlords had a waste pit where the waste was usually burned. The respondents expressed dissatisfaction with the way solid waste was managed both within their estate (premises) (33%) and in the neighbourhood (51%). They gave various explanations for their dissatisfaction among which: 33% and 50% of respondents stated that inadequate knowledge accounted for improper management within their premises and in the neighbourhood respectively, and 16% and 15% irresponsibility or lack of care for the environment within their estate and in the neighbourhood respectively (Fig. 1).

Table 5. Currently paying and willing to start paying

Respondent	Currently paying		Willing to start paying*	
	Yes	No	Yes	No
Within university	0%	100%	19.4%	80.6%
Outside university	4.7%	95.3%	43.7%	56.3%

* $\chi^2=6.609$, d.f.=1, P=.01

Table 6. Ranking the respondents by amount they were willingness to pay

Rank	Amount (KShs.)	Percentage of respondents
Low	<300	62
Average	301-600	33
High	>600	5

When asked how they would want to pay the amount, 66% of those willing to pay preferred a direct waste charge whereas 34% preferred the amount to be inclusive of rent or property charges

Table 7. Coefficients for multiple linear regression^a

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error			
1	(Constant)	517.225	155.561		3.325	.002
	Age	-64.148	24.636	-.384	-2.604	.013
	Education level	-39.338	25.284	-.259	-1.556	.128
	Income	27.816	22.745	.205	1.223	.229
	Awareness	53.536	43.106	.181	1.242	.222

a. Dependent Variable: amount willing to pay for waste collection
Where: Adjusted $r^2=0.138$, F= 2.688, P=.045

Table 8. Relationship between willingness to start paying and education and awareness levels

	Willing to start paying		Total	Significance
	Yes	No		
Education level	69	101	170	$\chi^2=8.288$, d.f.=6, p =.218
Awareness	69	108	177	$\chi^2= 6.529$, d.f.=6 p=.367

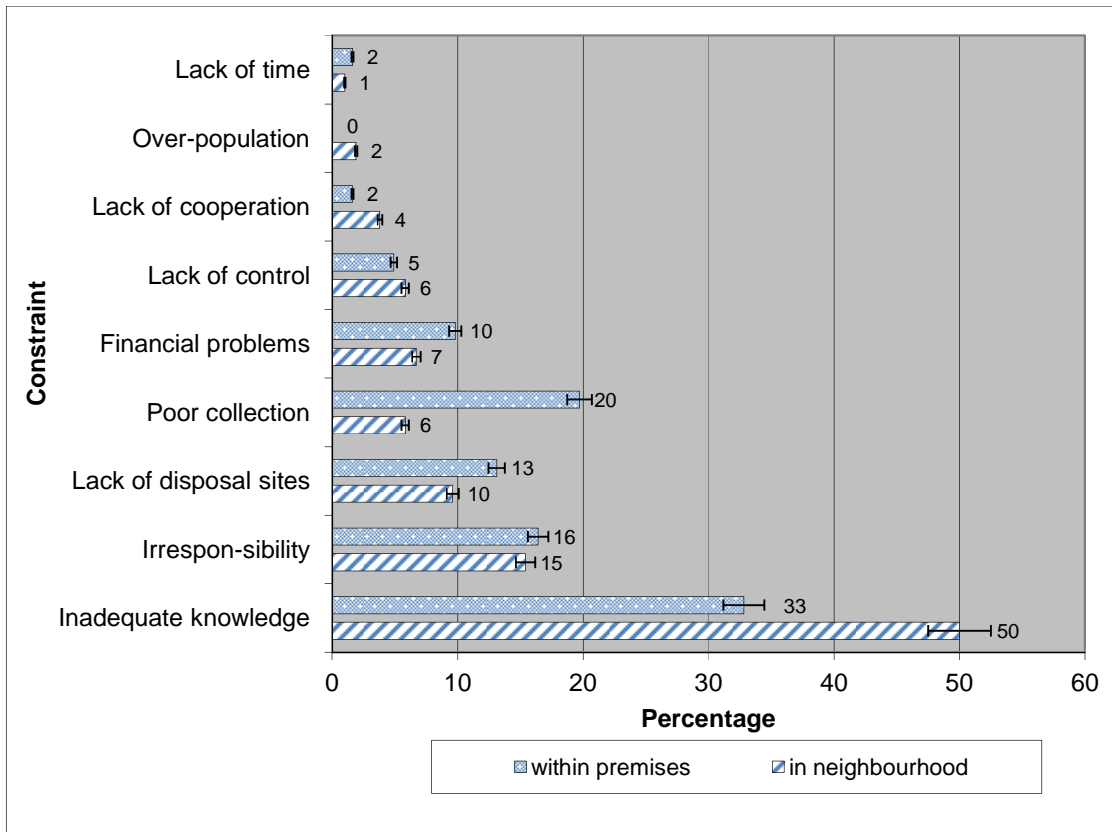


Fig. 1. Reasons for poor waste management in the neighbourhood and within premises

Inadequate knowledge and irresponsibility in aggregate made up for 65% and 49% of constraints for management within the neighbourhood and within estates respectively. Given that both of them are closely linked to lack of awareness, a focused and sustained awareness campaign might contribute much in enhancing good management.

4. DISCUSSION

Less proportion of respondents within the University (who had higher income and awareness) were willing to start paying compared to respondents outside the University. This was contrary to expectations as it would have been expected that a higher proportion of respondents with higher incomes and awareness would be willing to start paying. This could be because within the University, waste collection service was already being offered at no cost but the service was missing outside the University. Consequently, many residents within University might not have seen the need to take an extra burden that was already being catered for

whereas outside the University, where there are no services, it would be expected more respondents to be willing to start paying even though their income was significantly lower. Similarly, Niringiye and Omotor [22] reported that some households in India were unwilling to pay as they opined that property rates should cover solid waste collection. Jones et al. [23] associated refusal to pay with protest responses, zero valuation of environmental goods or budget constraints.

Of the variables: Age, education level, income and awareness only age had a significant (and negative) influence on amount of money respondent were willing to pay meaning that the older one was, the less amount of money one would be willing to pay. This could be because the older one was, the more financial responsibilities one had and hence willing to spend less on waste services. The lack of significant influence of income, education and awareness levels may be explained by the differences between the populations within and outside the University. Respondents within the

University, who had higher incomes, education and awareness, could have understated the amount they were to pay since they were already accessing the service without paying. Further, the respondents within the University could have assumed that they were already paying for the collection indirectly hence reluctant to state a higher amount. Similarly Hagos, Mekonnen and Gebreegziabher [24] found that all respondents under 40 years were willing to pay for improved waste services while only about three quarters of over 40 years were willing. Further, Subhan, Ghani, & Joarder [25] found that age had a significant influence to the willingness to pay. According to Anschütz [26] community perception of fees and of the waste collection service is essential for its willingness to pay and if residents think they already pay for collection through taxes, or if they do not trust the service, they refuse to pay.

Coad [12] reported that for the poor, the willingness to pay for waste collection is usually low which contrast our finding since more outside the University, with lower incomes, were willing to pay for waste collection. Nevertheless, outside the University, more than 50% were unwilling to start paying which could be because of absence of waste collection services. Korfmacher [9] observed that a successful collection system could increase residents' confidence and willingness to pay rates while Cointreau-Levine and Coad [8] recommend that it is not only important to carry out a willingness to pay study before the service but also after the service is offered as it is difficult for people to accurately predict their actual willingness to pay.

Willingness to pay is also influenced by awareness on waste management. In Dar-es-Salam contractors carrying out waste collection cited low public awareness as one of the reasons for low payment of collection fee [27]. Jones et al. [23] found a significant relationship between awareness and willingness to pay for waste services. Although Jones et al. [23] only focused on the link between willingness to pay and formal education, the finding indicated that education level significantly influenced willingness to pay with the more educated willing to pay more for waste services. In contrast, in our findings awareness and education did not associate significantly with willingness to start paying and did not influence amount to pay. Desa et al. [14] found that formal knowledge was not consistent with attitudes with even those who have acquired knowledge on waste management having negative attitudes towards the same.

Awareness is a key component of sustainable waste management. In the study, the percentage of respondents who reported lack of awareness as one of the constraints was high. According to Visvanathan and Trankler [28], lack of sufficient awareness at the grassroots level of the waste generators adds to the problem of littering, resulting to a serious threat to public health due to environmental pollution. Therefore, the generators (public) of waste must be made aware of the hazards posed by ineffective management of the refuse. Studies have shown that there is little awareness of the public health consequences of urban waste [13]. Mongkolnchaiarunya [29] reported that in Thailand, lack of awareness and knowledge were among the factors that made people not to separate their wastes at home.

5. CONCLUSION AND RECOMMENDATIONS

From the study, the following conclusions were made:

- Waste management is unsatisfactory in the study area since there are no waste services in the community outside the University. The local authority has so far not organised any form of waste collection or encouraged informal waste management.
- The capacity for informal waste management exists although it is undeveloped. Currently, waste collection in community around the University is minimal but it has been established that about 40% of the population were willing to start paying for waste collection which is an opportunity that may be explored by entrepreneurs in the face of neglect by the local authority.
- Awareness on waste management was generally low for all respondents. This is emphasised by the fact that lack of knowledge and irresponsibility were cited as major constraints.

The recommendations were:

- Waste collection can be improved in the area around the University. The most important thing would be for the local authority to come up with a waste management strategy by engaging the various stakeholders. The key agenda should be to enhance waste collection and

designate a disposal area which should be controlled. Further, in line with sustainable waste management approaches, focus should be given to recovery and recycling of waste materials.

- In the long-term, the local authority needs to take charge of waste collection and disposal but in the short-term the authority can engage with individuals or informal groups who have interest in the waste sector to raise their capacity to collect, to recover and to recycle materials from the area. The local authority can even allow informal waste managers to levy a direct fee to waste producers. As noted by Korfmacher [9] some successful programs have involved making primary collection contractors responsible for collecting their own fees.
- Awareness need to be enhanced if waste management is to be improved in rapidly urbanising areas and specifically in the study area. The local community needs to be provided with basic information on how to minimise their waste and the role of each member in ensuring a clean and healthy environment. A community that is aware might be more willing to support efforts to enhance waste management. Within the University, a waste management fee may need to be introduced to resident staff which would enhance awareness and responsibility towards proper waste management. Greater sensitisation on the need for proper waste management would counter inadequate knowledge (low awareness) and irresponsibility which emerged as the major constraints.

ACKNOWLEDGEMENTS

Egerton University through the Division of Research and Extension is appreciated for providing the funding to carry out the research.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Sembiring E, Nitivattananon V. Sustainable solid waste management toward an inclusive society: Integration of the informal sector. *Resources, Conservation and Recycling*. 2010;54:802–809.
2. Besiou M, Georgiadis P, Wassenhove LNV. Official recycling and scavengers: Symbiotic or conflicting? *European Journal of Operational Research*. 2012;218(20): 563–576.
DOI: 10.1016/j.ejor.2011.11.030
3. Wilson DC, Araba AO, Chinwah K, Cheeseman CR. Building recycling rates through the informal sector. *Waste Management*. 2009;29:629–635.
4. Asim M, Batool SA, Chaudhry MN. Scavengers and their role in the recycling of waste in Southwestern Lahore. *Resources, Conservation and Recycling*. 2012;58:152–162.
5. Uiterkampa BJS, Azadib H, Ho P. Sustainable recycling model: A comparative analysis between India and Tanzania. *Resources, Conservation and Recycling*. 2011;55:344–355.
6. United States Agency for International Development (USAID). *Environmental guidelines for the USAID Latin America and Caribbean Bureau*. USA: USAID; 2008.
7. Klundert A, Muller M. *Community based waste collection and small scale enterprise development in waste recycling in Dar es Salaam*. Netherlands: Advisors on urban environment and development; 1998.
8. Cointreau-Levine S, Coad A. *Private sector participation in municipal solid waste management*. Switzerland: SKAT; 2000.
9. Korfmacher KS. *Solid waste collection systems in developing urban areas of South Africa: An overview and case study*. *Waste Management & Research*. 1997; 15:477-494.
10. Taylor DC. *Mobilizing resources to collect municipal solid waste: Illustrative East Asian case studies*. *Waste Management & Research*. 1999;17(4):263-274.
11. Japan International Cooperation Agency. *Supporting capacity development for solid waste management in developing countries: Towards improving solid waste management capacity for the entire society*. Tokyo: Japan International Cooperation Agency; 2005.
12. Coad A. (Ed.). *Solid waste collection that benefits the urban poor*. Switzerland: Collaborative Working Group on solid waste management in low- and middle-income countries; 2003.
13. Doan PL. *Institutionalizing household waste collection: The urban environmental*

- management project in Côte d'Ivoire. Habitat INTL. 1998;22(1):27-39.
14. Desa A, Kadir NBA, Yusooif F. Approach to solid waste management (SWM) – A case study of a University in Malaysia, in Rebellon LFM. Waste management - an integrated vision; 2012. ISBN 978-953-51-0795-8 Available:<http://dx.doi.org/10.5772/48169>
 15. Meyer A. Does education increase pro-environmental behavior? Evidence from Europe. Ecological Economics. 2015;116:108–121.
 16. Republic of Kenya. Nakuru district development plan, Nairobi, Kenya: Government Printer; 2000.
 17. Kenya National Bureau of Statistics. Kenya facts and figures; 2008. Available:http://www.knbs.or.ke/index.php?option=com_phocadownload&view=category&id=20:kenya-facts-figures&Itemid=595 (Retrieved on 21st March 2016)
 18. Kenya National Bureau of Statistics. Kenya facts and figures; 2011. Available:http://www.knbs.or.ke/index.php?option=com_phocadownload&view=category&id=20:kenya-facts-figures&Itemid=595 (Retrieved on 21st March 2016)
 19. Kenya National Bureau of Statistics. Kenya facts and figures; 2012. Available:http://www.knbs.or.ke/index.php?option=com_phocadownload&view=category&id=20:kenya-facts-figures&Itemid=595 (Retrieved on 21st March 2016)
 20. Kenya National Bureau of Statistics. Kenya facts and figures; 2015. Available:http://www.knbs.or.ke/index.php?option=com_phocadownload&view=category&id=20:kenya-facts-figures&Itemid=595 (Retrieved on 21st March 2016)
 21. Kathuri NJ, Pals DA. Introduction to educational research. Njoro, Kenya: Educational Media Centre Egerton University; 1993.
 22. Niringiye A, Omotor DG. Determinants of willingness to pay for solid waste management in Kampala City. Current Research Journal of Economic Theory. 2010;2(3):119-122.
 23. Jones N, Evangelinos K, Halvadakis CP, Iosifides T, Sophoulis CM. Social factors influencing perceptions and willingness to pay for a market-based policy aiming on solid waste management. Resources, Conservation and Recycling. 2010;54(9): 533–540.
 24. Hagos D, Mekonnen A, Gebreegziabher Z. Households' willingness to pay for improved urban waste management in Mekelle City, Ethiopia. Environment for Development, Discussion Paper Series; 2012. Available:<http://www.rff.org/files/sharepoint/WorkImages/Download/EfD-DP-12-06.pdf> (Retrieved on 21st March 2016)
 25. Subhan M, Ghani ABA, Joarder MHR. Urban community willingness to pay for improved solid waste management in Malaysian municipality: A choice modeling approach. Asian Social Science. 2014;10(18):122-136.
 26. Anshütz, J. Community-based solid waste management and water supply projects: Problems and solutions compared, a survey of the literature. Netherlands: Urban Waste Expertise Programme; 1996.
 27. Halla F, Majani B. Innovative ways for solid waste management in Dar-Es-Salaam: Toward stakeholder partnerships. Habitat INTL. 1999;23(3):351-361.
 28. Visvanathan C, Trankler J. Municipal solid waste management in Asia: A comparative analysis. Workshop on sustainable landfill management, Chennai, India. 2003;3-15. Available:https://www.researchgate.net/publication/242220878_Municipal_Solid_Waste_Management_in_Asia_A_Comparative_Analysis (Retrieved on 22nd January, 2015)
 29. Mongkolnchaiarunya J. Promoting a community-based solid-waste management initiative in local government: Yala municipality, Thailand. Habitat International. 2005;29:27-40.

© 2016 Kariuki et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<http://sciencedomain.org/review-history/15005>