SOLID WASTE MANAGEMENT PRACTICES AT EGERTON UNIVERSITY, NJORO CAMPUS AND THE COMMUNITY AROUND

ABSTRACT
The purpose of this study was to characterise existing solid waste management practices at Egerton University and in the neighbouring community. The study was a cross-sectional survey design and was carried out between January – May 2009 within Egerton University, Njoro campus and the community around it within Njoro division. The sample comprised 220 persons that was drawn from tenants, farmers and the business community. A semi-structured questionnaire was used to gather data while qualitative and quantitative analysis were done. The study established that 57% of the respondents took waste from household to disposal sites every day whereas the rest of the respondents removed it from the second day to once a fortnight. All the respondents within the University had some form of waste containers (bins) within their premises while less than 50% of the respondents outside the University had them. Waste pits were used for disposal by 48% of respondents. After disposal, the most common practice was burning of waste by 56% of the respondents. The waste generator and the landlord were reported as the most responsible for waste management by the majority. Waste prevention and reuse was common whereas waste recycling was rare.

Key words: Solid waste, recycling, reuse, waste separation, waste disposal, Egerton University,
Guerrero, Maas and Hogland (2013) reported that in 30 cities in 22 developing countries, waste is disposed in open dumps without leachate treatment, protection by a bottom layer, gases treatment and other important infrastructures but also the cities suffer from the illegal disposal of waste in rivers, lakes, oceans, drainage channels, empty lots and roadsides. Oteng-Ababio (2013) avers that in the low-income, high-density areas, in the developing countries, waste is often dumped in gutters, drains and streams. Furthermore, in Africa 47% of the waste is openly dumped, 9.2% openly burned and 8.4% disposed by other unhygienic methods (Oteng-Ababio, 2007 as cited in Oteng-Ababio, 2011). Mbiba (2014) reveals that, due to inadequate waste collection in the cities of Eastern and Southern Africa some households dispose waste by burning of plastics, burying of organic wastes in backyard gardens or various forms of illegal dumping and even though the fraction of organic waste was quite high, there is limited waste composting. In Gambia for instance about 90% of waste is disposed by open dumping (Sanneh et al, 2011).

The study area is an upcoming urban centre whose growth in population is fuelled by the increased enrolment in Egerton University. The purpose of the study was to evaluate the existing waste management practices within and around Egerton University, Njoro campus.

2.0 MATERIALS AND METHODS

2.1 Study location

The study was carried out in Njoro Division of Njoro District and covered communities living in Njoro and Mukungugu sub-locations of Njoro Location. Njoro Division lies between longitudes 35° 28’ E to 36° 10’E and latitudes 0° 13’ S to 1° 10´S which is to the South-west of Nakuru town and cover 313.6 km² (Nakuru District Development Plan, 2000). The nearest urban centre to the University is Njoro which is only five kilometres away and Nakuru town, the fourth largest town in Kenya, is about 25 Km away. The study population was 50,750 persons and 13,048 households (Kenya National Bureau of Statistics, 2007). Within the University, waste collection services are offered to the resident population whereas, outside the University there are no waste management services are offered.

2.2 Research design and sampling

This research design was a cross section survey and the sampling frame comprised the population within Egerton University and the neighbouring villages namely Mukungugu, Beeston, Mwigito, Erithia, Njokerio and Ng’ondu. The sample was made up of tenants,
farmers and business people. Within the University the sample included students, resident staff and members of business community. The sampling unit for tenants and farmers was households whereas for business enterprises it was individual businesses. The sampling design was stratified random. Only one tenant in every estate was the subject of the survey but in areas with detached housing units each house was treated as a unit whether it had one or more tenants. The subject of the study was the household head of every third house in each plot. The businesses comprising hotels, groceries, posho mills, butcheries, retail shops among others, were sampled proportionately. The shopping centres where most businesses were located are Kwa-Wright, Egerton Gate, Beeston centre and Njokerio centre. When sampling university students, the sampling units were the halls of residence. The sample size used was 220 based composed of 80 businesses, 80 tenants, 30 farmers and 30 students. The sample size was based on the recommendations by Kathuri and Pals (1993) 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.

2.3 Data collection and analysis
Structured questionnaires were used to collect data on a wide variety of factors of interest that included the existing waste management practices, attitudes on existing practices, constraints to proper management and socio-economic information. Data was analysed using the Statistical Package for Social Sciences (SPSS). The analysis was achieved by descriptive statistics.

3.0 RESULTS AND DISCUSSIONS
3.1 Study population
Most of the farmer respondents were female whereas most of the students and tenants were males. The farmers had the highest proportion of respondents with the lowest level of education. The farmers had the highest mean age with the lowest mean income of Shs 9500 as compared to tenants who had a mean income of Shs 91,430.

3.2 Storage, collection and disposal of waste
A majority of the respondents stored their waste temporally before taking the waste out of their households (77%). There were a variety of apparatus used to store the waste: waste bins by 43%, buckets (16%), plastic bags (2%), sacks (8%) and cartons (8%). The rest (23%) did
not use any form of containers and hence removed it from their households immediately. Within the University, 45% of the tenants had waste bins, 45% used buckets and 10% used plastic bags. Of tenants outside the University 50% did not have any waste bins, 40% had waste bins, 5% used plastic bags and 2% buckets while 3% used cartons. Among business people within the University 30% used waste bins and 30% buckets while 20% used sacks and 20% cartons. Of business people outside the University 32% used waste bin, 27% buckets, 20% sacks and 20% used cartons. All the University students (100%) had waste bins. Amongst the farmers 60% had no waste bins, 23% had the waste bins, 10% used cartons, 7% used sacks and 3% plastic bags. Mbiba (2014) similarly found that in low income areas many resident use alternative containers like sacks instead of the conventional waste bin while others dispose their waste immediately without storage.

From the households, 57% of the respondents removed their wastes from the households daily, while 11%, 10% and 17 did so twice, thrice and once a week while 5% did it once or less in two weeks (Figure 1).

![Figure 1: Frequency of emptying bin](image)

For the disposal of waste from the household, the largest proportion of the respondents (48%) had a waste pit in their yards where they disposed their waste while about 28% used open dumps within their compound or in the neighbourhood and 0.4% placed the waste into a communal container (Figure 2). Some of the respondents took their waste to transfer locations for collection (8.5).
3.3 Waste disposal and disposal-site management practices

For most respondents within the University and a few from the community around, waste removed from the household was temporary stored before removal (21%). Removal within the University entailed collection from transfer points to dumpsite located inside the University. On the other hand, outside the University especially, waste removed from temporally points was either taken to a dumpsite near Njoro River (Kwa Wright and Egerton Gate shopping centres), which was a disused quarry or the decomposed organic waste taken to the farm for use as manure. Of the respondents who reported that their waste was later removed, the majority (79.5%) were within the University and the rest outside. On the other hand, of the respondents whose waste was not collected, the majority (63%) burned their waste after disposal whereas 12% buried after disposal (Figure 3). Some of the respondent did nothing further to the waste.
Figure 3: Waste management practices after removal from the households

Practices after disposal (burning, burying, removal) were carried out in varying frequencies: 31% carried out management practices within a week, 32% did so once in two or more weeks, 14% did so once a day, 9% managed it twice a week whereas 7% did it immediately after disposal and similar percentage three times a week. All other practices were most common among respondents outside the University and rare within the University. In this regard, burning was practiced by 84.2% of those outside the University and 15.8% of those inside the University, 83.3% of those where nothing further was done to the waste taken to the dumpsite were outside the University.

About 57% of the respondents reported being solely responsible for the management practices carried out after taking the waste to the disposal site. About 29% of the respondents revealed that landlords were whereas 5% reported that the practices were done by a private company (or individuals paid to do so) and a similar percentage (5%) by a neighbourhood group (Figure 4).
3.4 Waste prevention, separation, reuse and recycling

Fifty four per cent of respondents reported going shopping with their own bags or re-using plastic bags as compared to 46% who did not. The reasons given for carrying bags while shopping rather than getting a fresh one from the shop were: for environmental reasons that is to reduce amount waste plastic bags getting into the environment (14%), to save the money that would be used to buy a new bag (34%) whereas the rest carried their own shopping bags because they were stronger than those from the shop (3%) or because they were simply more convenient (2.7%).

The majority of the respondents (64%) did not separate their waste into different categories before disposal. Whereas 36% reported separating their waste before disposal, there was no organised waste separation. The reported separation was not deliberately separating the different waste streams before disposal but rather, recovering materials regarded as still valuable for reuse or sale. Only 0.5% of all respondents (one household) was observed to separate different waste categories into different bins before disposal. Babaei et al., (2015) indicated that 1.7% of respondents in a survey in Abadan, Nigeria practiced source separation with women’s participation being more than three times that of men. In Mombasa, there was no formal waste separation program but a majority of households were ready to separate wastes, 83.3% in low-income areas, 81.8% in middle-income areas and 91.4% in low-density high income areas (Mbiba, 2014).
Recovered waste material for reuse was reported was various types of waste with reuse of plastics being reported by the largest proportion of respondents (Figure 5). Plastic cans, plastic bags and plastic bottles were reported as being reused by 43.9%, 43% and 41.2%, respectively. Reuse rates for waste paper, wood, food, vegetables and animal waste were all above 20%. The rates are much higher in some respondents than others for instance; reuse of food wastes among farmers was virtually 100%. Farmers did not dispose any food wastes, any remains were reused as animal feed. Similarly Palczynski (2002) noted that in households in low-income peri-urban areas, like the study area, resource recovery begins with the reuse of plastic bags, bottles, paper, cardboard, and cans for domestic purposes, extending their useful life.

![Figure 5: Percent Waste Reuse in the Study Area](image-url)

In this regard, it was also recorded that even businesses facilitated diversion of waste from the dumpsite. In most businesses that generated food wastes like hotels, butcheries and groceries, it was established that food wastes were sold or given to farmers. Wastes from hotels were mostly sold to chicken and pig farmers while grocery wastes were sold to dairy farmers. Other wastes that was recovered for sale included scrap metals, some types of plastics, papers and wet batteries. Guerrero, Maas and Hogland (2013) noted that commonly recycled materials in communities include plastic, paper,-metal, glass, organic, battery, electric and electronic. On the other hand, Wilson (2009) observed that materials like plastics, paper, cardboard, aluminium, steel, other metals, glass and textiles were recovered in Karachi but mostly for sale. One of the reasons given for recovery of waste materials in the study...
area was for use as fuel whereby, some respondents revealed that plastics were widely used as fuel for cooking due to shortage of woodfuel. Recycling activities in the community were very rarely encountered during the study. However, some materials were recycled into other products for instance textile waste was made into fireless cookers or pillows. Similarly, Dhokhikah, Trihadiningrum and Sunaryo (2015) found that recycling activities are sometimes practiced by a few members of the community, reporting that in eastern Surabaya only 5% of the respondents were involved in creating of unique handcrafted goods.

Of those who recovered materials, the reasons given for the practice were varied. Only 17% of the total respondents recovered waste due to environmental reason being concerned that the waste should not become an environmental problem. Other respondents (62%) reused their waste due to financial reasons, by saving money that could have been used on a new item or goods. Finally, 10% reused waste because they considered the items/waste as still useful that is, it was only considered as waste after being reused to the point that it had no further utility. This is in line with other findings that note that for low income people, involvement in sustainable waste practices is usually economically motivated, while for higher income people the majority do so due to their sense of social responsibility in the community (Permana et al, 2015).

4.0 CONCLUSIONS AND RECOMMENDATIONS

Waste practices in the study were not environmentally sustainable for instance open dumping. In this regard, there is need for promotion of environmental awareness to enhance reuse and recycling, discourage open dumping and promote better methods of disposal and management of disposal areas. This can be done by encouraging use of waste pits rather than open dumping, fencing of disposal areas to prevent spreading of waste by wind, composting of waste and separation of hazardous waste like electronic waste from the general waste.

There was no organised waste management in the community around the university. Therefore, a community approach to waste management should be encouraged in the community around the University. This can be achieved by promoting the formation of waste collection and recycling groups, formation of waste management committee to come up with guideline on waste management in the area and community policing on waste management.
REFERENCES


