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RESEARCH ARTICLE

THE PLASTIC WASTE MENACE IN KENYA: A NAIROBI CITY SITUATION

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ABSTRACT

In Kenya, over 24 million plastic bags are used monthly, half of which end up in the solid waste mainstream. Plastic bags now constitute the biggest challenge to solid waste management in Nairobi, the capital city of Kenya. Nairobi is home to three million, three hundred people. They are ingested by livestock endangering their health and even causing death; they choke soils and are slow bio-degraders. The study therefore endeavoured to meet the following objectives: to determine the sources of plastic wastes in Nairobi City and; to determine the factors contributing to the problem of plastic bags waste. A sample of 380 respondents was drawn from the target population using non-probabilistic approach. The age of the participants ranged from 13-60 years. A questionnaire with both structured and unstructured items was used for data collection. Interviews and observations were also made to enrich information from the questionnaire. The instruments were piloted to determine their validity and reliability. The study established that: households contribute the bulk of the solid waste which included; plastic bottles, carton boxes, metals, glassware, and sharp objects with plastic bags waste forming the bulk of the total waste. Main sources of the waste included plastic industries, supermarkets, shops, hotels, and hospitals. Main factors that contribute to accumulation of plastic wastes included: lack of adherence to the guidelines on solid waste management by stakeholders in the city, failure of the City Council of Nairobi to address the problem of plastic bag waste due to weak policies, and industries and supermarkets that produce and release large volumes of plastic bags to the consumers. The study therefore recommended that: consumers to be educated on the health hazards that emanate from poor disposal of plastic wastes and the Kenya government to legislate sound laws on plastic waste management to strengthen the by-laws for effective reinforcement in the city solid waste management. The government should encourage the establishment of plastic waste recycling industries to assist in plastic waste management.

INTRODUCTION

Plastics have revolutionalized the carrier bags industry around the world. Bags made from plastic material are not only durable, versatile and convenient, but also inexpensive, easily available and easy to store and transport on account of their thinness and lightness. Alternatives such as boxes and paper bags cannot handle liquids as well as plastic bags do. However, the very problem with plastic bag waste emanates from some of their advantages. First, because they are cheap there is excessive consumption and a tendency for misuse. In Australia, for example, an individual uses one new bag per day on average because they are free. While it is free to the customer, however, a plastic shopping bag costs the retail facility in that country about one cent (wholesale price), with a real average cost per household $ 10-15 per year (EPHC, 2002). Rapid increase in population and improvements in quality of life, especially in developing countries, have aggravated the problems of solid waste generation. It implies that the municipal authorities will require huge capital investments and operational strategies for collection, transportation, and disposal of solid waste. Delimiting factors such as limited financial resources have made it imperative to replace the existing ad hoc methods employed in solid waste management and planning (MacDonald 1996; Chang & Chang 2001). Second, most of the plastic bags produced are too thin and fragile to be re-used. This characteristic of plastic bags lends them to inadvertent littering, which has become a serious problem in urban centres the world over. Littering of plastic bags is associated with numerous environmental problems: First, it causes visual pollution that affects such sectors as tourism. Second, plastic wastes block gutters and drains creating serious storm water problems. Bangladesh, for instance, imposed a ban on plastic bags in March 2002 following flooding caused by blockage of drains (EPHC, 2002). Third, plastic wastes that find their way into the sea and

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other water bodies kill aquatic wildlife when the animals ingest the plastics mistaking them for food. Fourth, consumption of plastic bags by livestock can lead to death. Fifth, plastics take 20 to 1000 years to break down.

In Kenya, for example, plastic bags waste forms the largest proportion of solid waste. With the rising affluence and public's eager embrace of western consumerism, there is a staggering demand for plastic products. The convenience and cost effectiveness associated with plastics has translated into the throw-away culture in the Kenyan society. Furthermore, the increasing rate of urbanization in Kenya has led to increased use of plastics hence increased plastic bag waste generation (O'Connor, 1996). Over 24 million plastic bags are used monthly in Kenya, half of which end up in the solid waste mainstream. Plastic bags now constitute the biggest challenge to solid waste management in Nairobi, the capital city of Kenya and home to three million, three hundred people. Plastic bags of various sizes and all colours are found dotting the landscape. They are ingested by livestock endangering their health and even causing death, they choke soils and they are slow bio-degraders. The expansion of plastic production and consumption is having a significant impact, both visibly and invisibly on the socio-physical environment in Kenya (Ikiara *et al.*, 2004).

Attempts to rid Kenya's environment of plastic bags have been met with resistance from manufacturers and consumers alike. Nearly seven years ago, National Environment Management Authority NEMA) in Kenya recommended a ban on plastic bags; the government slapped a 120 percent tax on manufacturers producing thin, single-use plastic bags. However, this move met resistance from Kenya Association of Manufacturers who pleaded for a transitional grace period. As one walks through the streets of Dandora in Nairobi, one dodges the falling plastic bags, manoeuvres through the off-putting landscape of garbage heaps and ignores the often smelly air. Lots of plastic bags blown out of the dumping site are perched on rooftops. The Dandora dumpsite is within a high density residential area. It is impossible to control unregulated recovery of material through scavengers, fires, leach-ate and waste disposed in the site. The dumpsite is not securely fenced. The existence of the dumpsite in a high populated area is impacting negatively on the health of the residents. A study reveals that most people around the 26.5 hectare Dandora dumpsite breathe in the smoky air and many complain of respiratory problems, abdominal and intestinal complications, and malaria, (UNEP, 2007). Many of Nairobi's poor engage in waste picking as a means of income generation. Scavengers are estimated to collect 20 tonnes of the approximately 800 to 1000 tonnes generated daily in Nairobi. The degree of scavenging is very intensive at the main Dandora waste disposal site. The scavengers are mainly single men averaging about 27 years of age. They are usually long-term residents of Nairobi; it is not a job for recent migrants because detailed information as to where to find the garbage is needed and one must have linkages to the market to enable one to sell (Mwaura, 1991).

The City Council of Nairobi's capacity of waste collection and disposal cannot cope with the current situation, resulting in large amounts of uncollected solid waste, much of which is organic in nature with plastic wastes comprising an appreciable amount of total solid waste generated. Out of the 2400 tonnes of solid waste produced per day, 20.0% is plastic material, 12.0% paper; 8.0% glass/metal/other; and 60.0% organic. However, these wastes are common mostly in informal settlements or along some of the major highways of the city (JICA, 1998; Bahri, 2005; and Karanja, 2005). Based on the forgoing, the present study attempted to establish the types and sources of the plastic wastes as well as the factors that enhance the menace of plastic waste in Nairobi city. The study therefore attempted to meet the following objectives:

(a) To determine the sources of plastic wastes in Nairobi City and;
(b) To determine the factors contributing to the problem of plastic bags waste.

MATERIALS AND METHODS

The study was guided by descriptive survey design. The study's target population comprised six groups of people in Nairobi city. These groups included: Managers and staff of supermarkets that supply free bags to their customers such as Nakumatt, Uchumi, Tuskys, Naivas, Ebrahim, and Ukwala; Staff of NEMA concerned with Solid Waste Management (SWM); Private companies involved in waste collection in Nairobi city estates such as Kamongo Waste Paper Limited., Mukuru Recycling Center, Pambazuka Company among others. Community Based Organizations (CBOs), involved in plastic waste management, namely Karen and Langata District Association (KARENGATA), Kiambu Usafi group (in Kibera), Kiambu Youth Group (in Kibera, the largest slum are in the city), Department of Environment at City Council of Nairobi (CCN) in charge of management of solid waste and the residents of Dandora estate who live around the Dandora dumpsite. The selection criteria were based on participation in plastic bag waste management; and proximity of the population to the Dandora dumpsite. This population was believed to have provided optimum information with regard to their experiences with plastic bag waste generation, disposal, and management.
A sample of 380 respondents was drawn from the target population using non-probabilistic approach. The age of the participants ranged from 13-60 years. This sample size was chosen because members of the study population could not be found in one place. Owing to the method of data collection employed, this sample size was easily accessible for interviewing and observation. This study therefore employed purposive sampling technique, through which the researchers were very specific on whom to include in the sample so as to get focused information. This technique allowed the selection of typical and useful cases only. Two types of questionnaire were used which contained both open and closed ended items. The first questionnaire was administered to all participants (N=380) namely: NEMA staff; CCN technical staff; supermarkets owners and staff; Dandora residents and; Community Based Organizations staff. The questionnaire was self-administered using the drop-and-collect approach. The content of the questionnaire included items seeking information such as: Background information of the participants, type of solid waste produced, segregation of solid waste at source of

production, how frequent plastic bag waste is collected and disposed of, methods used to dispose of plastic bag waste, presence of clear guidelines and policies to solid waste management, capacity of City Council of Nairobi to manage plastic bag waste, level of experience and training of CCN technical staff, involvement of private companies and Community Based Organizations in solid waste management, contribution of industries and supermarkets to plastic bag waste menace, sustainability of current methods of plastic bag waste management, alternative methods to plastic bag waste management, and recommendations on management of plastic bag waste in Nairobi city.

The second questionnaire was administered to NEMA and CCN (N=70) who were both knowledgeable in environmental matters and management operations. The content included background information of the participants; socio-economic and ecological effects of plastic bag waste; failure of CCN to address the issue of plastic bag wastes in Nairobi; how relaxed policies at CCN have contributed greatly to the plastic bag menace; the need for more landfills in Nairobi City; how well-trained the CCN technical staff is; whether some of the methods used in disposal of plastic bags are environment-friendly and sustainable; City Council of Nairobi (CCN) does have clear enforceable policies; whether clear by-laws are put in place to promote waste reduction, recycling and community participation; the legislative Acts , policies, and guidelines concerned with plastic bag waste management in Kenya; responsibilities for collection, handling, and disposal of plastic bag waste what suggestions respondents could make on management of plastic bag wastes as well as naming the key stakeholders in management of plastic bag wastes.

Interviews were conducted for the purpose of clarifying issues raised from the responses in the questionnaire and also to collect information that could not be directly observed. Through interviews, historical information was sought, and this allowed the researchers to obtain information on: role played by various stakeholders in management of plastic bag waste, current methods used in plastic bag waste management; record of activities undertaken by CCN in managing plastic waste; and recommendations of various stakeholders on sustainability of plastic bag waste management methods. Document analysis on the conventional practices on solid waste management in Nairobi city was also pursued. It offered recorded information related to the problem under study. At the City Council of Nairobi, a lot of unobtrusive information was gathered through document analysis. The documents analyzed were: the available policies, by-laws such as Nuisance by-laws, Acts such as the Public Health Act, Land Act, EMCA, 1999, and guidelines on plastic bags waste management, and schedule of activities carried out by CCN as far as Solid Waste Management (SWM) is concerned. Observation technique also enabled the researchers to confirm what people understand by solid waste management in the city. This assisted to determine the attitude and perceptions of people with regard to plastic bag waste management. Incidences such as littering, dumping, collection of wastes, selling of plastic bags and recycling activities were observed. This technique offered first hand information on solid waste handling in the city. Data analysis was mainly by descriptive statistics and qualitative approaches and then presented in tables, figures as well as being reported in prose.

RESULTS

Results were organized based on the study objectives as follows:

Types and Sources of plastic wastes in Nairobi City

The study sought to find out the types and sources of solid waste generated in the city. All the 380 respondents were therefore asked to identify the types and sources of solid waste generated in Nairobi city. The results were as summarized on Figure 1.

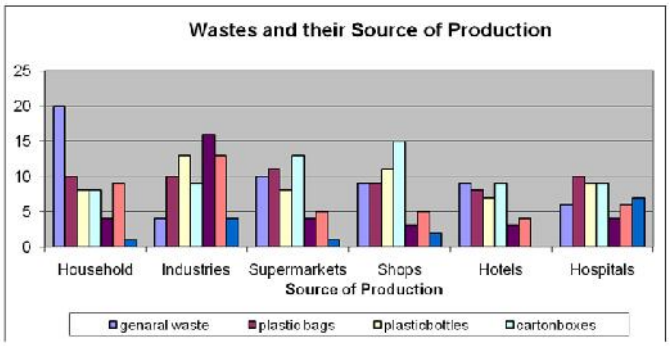

Figure 1. Contribution of various City Stakeholders to Solid Wastes Accumulation

The results as shown in Figure 4.1 indicated that households contribute the bulk of the solid waste produced at all the sources in the city. The other significant sources included industries, supermarkets, shops, hotels, and hospitals in that order. From all the sources, plastic bag waste forms the bulk of the total waste. Other wastes included plastic bottles, carton boxes, metals, glassware, and sharp objects.

The study also sought to establish whether solid wastes are separated at the source of production before dumping. The results were as shown on Table 1.

Figure 2. Non-segregated Solid Waste at Dandora dumpsite

Table 1. Whether Separation of Plastic bags from other Wastes was done at the Source

Response	FREQUENCY Dandora Residents (133)	CCN (N=21)	CBOs (N=21)	Private Companies (26)	NEMA (15)	Super-Markets (18)	Total 234 out of 380
Strongly Agree	35 (26.3%)	2 (9.5 %)	0(0%)	0 (0%)	1 (6.7%)	1 (5.6%)	39 (16.8%)
Agree	0 (0%)	0 (0%)	4 (19%)	2 (7.7%)	1 (6.7%)	0(0%)	16 (6.9%)
Strongly disagree	72 (54.1%)	16 (76.2 %)	13 (61.9%)	14 (53.8%)	10 (66.7%)	10 (55.6%)	126 (53.5%)
Disagree	24 (18%)	0 (0%)	1 (4.8%)	8 (30.8%)	3 (20%)	5 (27.8)	41 (17.5%)
Undecided	0 (0%)	3 (14.3%)	3 (14.3%)	1 (3.84%)	0(0%)	2 (11.1%)	9 (3.9%)
Missing	2 (1.5%)	0 (0%)	0 (0%)	1 (3.84%)	0 (0%)	0 (0%)	3 (1.3%)
Total Responses	133 (100%)	21 (100%)	21 (100%)	26 (100%)	15 (100%)	18 (100%)	234 (100%)

Table 2. Factors Contributing to Plastic Bag Waste problem

ITEM	SA	A	U	D	SD	NR	TOTAL %
1. Industries and Supermarkets that produce and release large volumes of plastic bags have contributed greatly to the littering of the city	112 (47.8%)	70 (29.9%)	0 (0%)	11 (4.7%)	30 (12.8%)	11 (4.7%)	234 (100%)
2. CCN has failed to address the problem of plastic bag waste in Nairobi due to relaxed policies	167 (71.4%)	22 (9.5%)	22 (9.5%)	11 (4.7%)	0 (0%)	12 (4.9%)	234 (100%)
3. Agencies that handle solid waste are discriminative, low-income estates being the most affected	132 (56.7%)	47 (20%)	30 (12.8%)	9 (3.7%)	11 (4.7%)	5 (2.2%)	234 (100%
4. CCN is overwhelmed by the large volume of plastic bags released into the general waste stream	94 (40%)	70 (30%)	23 (10%)	12 (5%)	18 (7.5%)	18 (7.5%)	234 (100%
5. The required guidelines on SWM are not adhered to by stakeholders in Nairobi due to their negative attitude toward plastic bag waste management	146 (62.5%	47 (20%)	12 (4.9%)	11 (4.7%)	9 (3.7%)	11 (4.7%)	234 (100%
6. Inadequate landfills have aggravated the problem of plastic bag pollution.	111 (47.5)	64 (27.5%)	6 (2.5%)	35 (15%)	18 (7.5%)	0 (0%)	234 (100%
7. Facilities for collection and transportation of plastic waste are inadequate.	131 (56%)	53 (22.5%)	6 (2.5%)	29 (12.5%)	12 (5%)	4 (1.7%)	234 (100%

KEY: NR= No response for the item

The study further revealed that the waste generated is not separated at the source. With lack of separation at the source, all the waste is channeled to the dumpsite. This was shown by 72.1% (54.1%+18.0%) of the Dandora residents, 66.7% (61.9% + 4.8%) of the CBO staff and 76.2% of CCN staff, 84.6% of private companies' staff, 86.7% of NEMA staff, and 83.4% of supermarket staff do not agree to the fact that there is separation of plastic bags from other wastes at the source. This was confirmed by observation techniques followed by photographing of a dumpsite as shown on Figure 2.

As shown in Figure 2, jumbled solid waste at the Dandora dumpsite was an indication that the solid wastes were not separated at the source before dumping. With respect to types and sources of solid waste, results showed that solid waste is generated from familiar sources which include households, industries, hospitals, business, and hotels. These sources are similar to those experienced in developed Western countries such as the United States where municipal waste (household and commercial refuse) accounts for two-thirds of all waste (Cunningham and Saigo, 2001). Furthermore, it was revealed that solid wastes in the city are not segregated, with the exception of unstructured reuse of some waste materials at the household level. The private sector waste collectors, in addition, do not process waste in any way, which affects effective and efficient solid waste management. Consequently, the Dandora dumpsite is littered with all types of wastes from hospital wastes, manufacturing/industry wastes, paper and both bio- and non-biodegradable materials. These results concurred with most of the previous studies that indicated there is lack of waste segregation at the source of production. Hence the implication would be lack of resource recovery at the source for the purpose of re-use or recycling.

Factors Contributing to Plastic Bag Waste pollution in Nairobi City

To better understand the problem of plastic bag waste pollution it was necessary to find out the factors that contribute to the problem. All the 380 respondents were therefore asked to identify from among such factors those they believed contributed to the problem on a Likert scale. The responses from 234 participants out of the 380 who were accessed were as in Table 2.

As shown in Table 2, the respondents identified three main factors contributing to plastic bag waste problem as being: (a) lack of adherence to the guidelines on solid waste management by stakeholders in Nairobi city due to their negative attitude toward plastic bag waste management (62.5+20=82.5%), (b) failure of City Council of Nairobi to address the problem of plastic bag waste due to relaxed policies (71.4% + 9.5% =80.9%), and (c) industries and supermarkets that produce and release large volumes of plastic bags to the consumers have greatly contributed to the problem of plastic bag waste (47.8% + 29.9% =77.7%). The other factors in order of seriousness include: Facilities for collection, transport, and disposal of plastic bag waste are inadequate (78.5%); Agencies that handle solid waste are discriminative, the low-income estates being the most affected (76.7%); lack of adequate landfills has

aggravated the problem of plastic bag waste pollution (75%); City Council of Nairobi is overwhelmed by the large volume of plastic bags released into the solid waste stream (70%).

The results showed that lack of enforcement of laws, inadequate facilities for collection, transport and disposal of solid waste, lack of knowledge and awareness by the public, overproduction and overconsumption of plastics, and poorly trained staff at City Council of Nairobi were the major factors that lead to plastic waste menace in the city. These results confirmed the position held by various studies that the underlying causes of environmental damages due to production and consumption are mainly a combination of institutional, market, and policy failures (Field, 1997; UNEP, 2005). Out of the 40 City Council of Nairobi staff who participated in the study, only 25.0% of them agreed that they are well trained with regards to solid waste management. The UNEP (2005) study also revealed that, in Nairobi, like in many developing country cities, the solid waste sector is largely characterized by low coverage of solid waste management services, pollution from uncontrolled dumping sites, inefficient public services, chaotic and unregulated private sector participation and lack of a key solid waste management infrastructure (such as transfer facilities, sanitary waste disposal facilities and systems for waste separation).

Conclusion

Based on the results, the following conclusions were made:

i. Households contribute the bulk of the solid waste with a large proportion being plastic waste. Main sources of the plastic wastes were industries, and supermarkets.
ii. Main factors that contribute to accumulation of plastic wastes in the city were; lack of adherence to the guidelines on solid waste management by stakeholders, failure of City Council of Nairobi to address the problem of plastic bag waste due to weak policies, and industries and supermarkets that produce and release large volumes of plastic bags to the consumers.

Recommendation

The study therefore recommended that:

i. consumers to be educated on the health hazards that emanate from poor disposal of plastic wastes and
ii. The Kenya government to legislate sound laws on plastic waste management to strengthen the by-laws developed by the City Council to enable them effectively reinforcement the law in the city solid waste management. The government to encourage establishment of well regulated plastic waste recycling industries that may create a source of income to people involved at the same time reducing the plastic waste menace.

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