International Scholars Journals

African Journal of Environmental and Waste Management ISSN 2375-1266 Vol. 6 (1), pp. 001-011, January, 2019. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

Level of public awareness on effects of computer e-waste disposal management approaches on human health and the environment in Nairobi City County, Kenya

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Accepted 20 December, 2018

With the advent of rapid development of electronic technology and change in lifestyles, the lifespan of computer components and accessories has greatly reduced resulting in increased generation of computer e-waste. This paper explores the level of public awareness of potential impacts of computer e-waste on human health and environmental degradation of the urban area in Nairobi City County. Structured questionnaires were administered to 44 public institutions, 30 private companies and 156 households; random sampling for households and private companies and purposive sampling for public institutions. Despite respondents considering computer e-waste in the urban environment as serious and the responses received examined for the content of environmental and or human health concerns, only few mentioned environmental (12.5%) and human health (8.3%) considerations. Most respondents do not know the proper computer e-waste disposal management approaches and hence the reason why they stored the e-waste in houses and offices and also threw it together with other county solid waste. The study concludes that there is low public awareness and insufficient knowledge on the negative effects of computer e-waste on human health and the environment. The study recommends use of several media to bring public awareness of potential effects of computer e-waste on human health and the environment. The research recommends establishment of a county computer e-waste authority whose mandate is to implement a zero-e-waste policy. Emphasis should be on household's e-waste drop-off points, county computer e-waste recycling centre and wards community capacity building to absorb the spinoffs from the county computer e-waste recycling centre.

Keywords: Public awareness, computer e-waste, human health and environment risks, disposal management approaches.

INTRODUCTION

With the advent of rapid development of electronic technology and change in lifestyles, the lifespan of computer components and accessories has greatly reduced resulting in increased generation of computer e-waste. The computer e-waste contains both hazardous and valuable components. This paper explores the level of public awareness of potential negative impacts of computer e-waste on human health and environmental degradation of the urban area in Nairobi City County. The responses to this attribute were garnered from multiple respondents drawn from households, private companies and institutions. Aspects on public knowledge and attitudes

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canvassed through a wide range of analytical themes, namely cost of investments in the computer e-waste disposal management approaches, knowledge about contents of computer components and accessories with respect to effects on environmental sustainability and human health standards. Others are, options for reducing harmful effects of computer e-waste flows to the urban environment, prospects for the reduction of environmental and human health damages to the urban area by computer e-waste compared to other types of waste and perspectives on responsibilities of actors in the waste management regime in the City. Preferences for various media outlets for purposes of enhancing public awareness and inculcating favorable attitudes regarding environmentally sound and human health responsive computer e-waste disposal management approaches are also covered. The findings on each of these dimensions are described.

RESEARCH METHODOLOGY

Both qualitative and quantitative research methods were used to collect data from primary and secondary sources. This standpoint is in harmony with the philosophy of Miles *et al*., (1994), Bradley *et al*., (2007), Palinkas *et al*., (2015) that qualitative research methods are necessary supplements to surveys because they are capable of identifying causal mechanisms, dealing with complex local networks and sorting out the temporal dimension of events. The data required was obtained across operations level of computer e-waste disposal management through to the national and local level decision making arms of environment and human health regimes. The respondents were randomly and purposively sampled. To ensure an adequate level of confidence in the findings of the study, a sample size of 156, 44 and 30 respondents for households, institutions and private companies respectively was used. The secondary data was collected from materials in the form of publications such as reports, journals and internet resources. For primary data collection, a structured questionnaire was administered to public institutions, private companies and households under the government residential areas of Nairobi. To ensure a high rate of response, face to face interviews were conducted for primary data collection. This method was used because it would give better results since not everybody had access to the internet. The questionnaire had questions related to personal information, general awareness about computer e-waste disposal management approaches. Other information sought included perceptions about the gravity of computer e-waste disposal management approaches in the urban environment. Respondents were also examined on their awareness about harmful environment and human health impacts of computer e-waste, suggestions for reducing adverse effects of computer e-waste, user responsibility preferences for computer e-waste management, media preferences for public awareness creation and education, relative perspective on computer e-waste disposal management; and considerations for disposal of computer e-waste with other urban solid waste. The data was analyzed using IBM Statistical Package for Social Sciences (SPSS) Version 21 and presented using graphs, pie charts and narratives. The findings are as presented below.

RESULTS

Overall, many private companies were found to engage the NEMA certified e-waste collectors to collect and manage their computer e-waste. The institutions were found to keep their computer e-waste for at least one year before engaging the auctioneers in managing their computer e-waste while the household respondents stored their computer e-waste in their houses before they donated, gave away or sold to the waste collectors or recycling facility. The study established that in general, the institutions, private companies and households lacked knowledge on the negative impacts of the computer e-waste they held to their health and the environment if not disposed of in an environmentally sound manner. The specific findings on each of these dimensions are covered in the sections that follow.

Perceptions about gravity of computer e-waste disposal management approaches in the urban environment

Respondents from institutions were assessed on the extent to which they considered waste from computer components and accessories as part of waste flows from their respective institutions to the urban environment. As Figure 1 shows, an overwhelming majority (92%) responded in the affirmative. Only 3 respondents (6%) thought otherwise.

Out of the 44 respondents (92%) who responded in the affirmative, only a small proportion (23%) rated the gravity of concern with the computer e-waste flows to the environment from their respective institutions as “very serious” compared to the 36% who felt that the problem was “only slightly serious” (Figure 2). Some in the category of “can’t tell” in Figure 2 (n=44) was found to be somewhat indecisive on the level of seriousness about this matter.

On the same attribute, these respondents were asked to advance reasons for considering the problem of computer e-waste in the urban environment as serious. In the context of this study, the responses received were examined for the content of environmental and or human health concerns. As Figure 3 shows, only 13% and 8.3% mentioned environmental and human health considerations respectively. A vast majority (71%) in the category of “other” in Figure 3 on the explanations advanced were outside the bounds of human health or

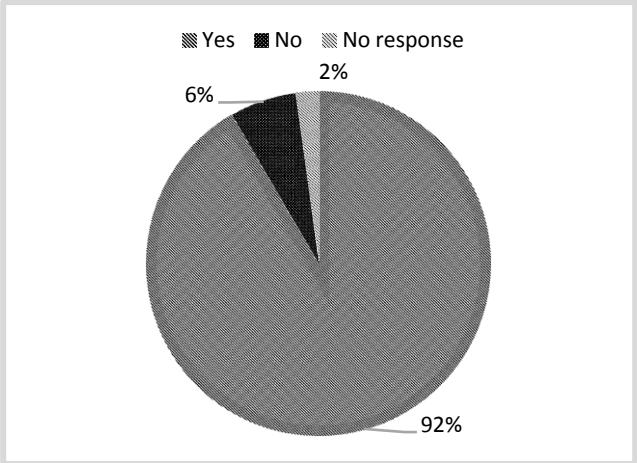

Figure 1. Consideration of Used Computer Components and Accessories within Institutions as Waste.

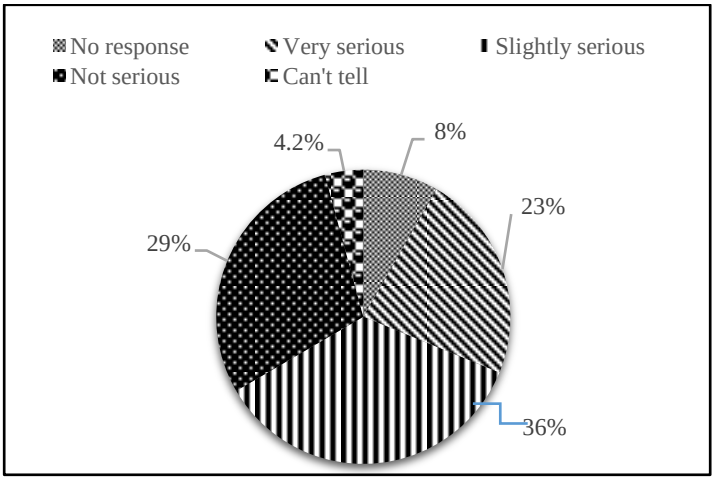

Figure 2. Degree of Seriousness Rating of Computer E-Waste Problem.

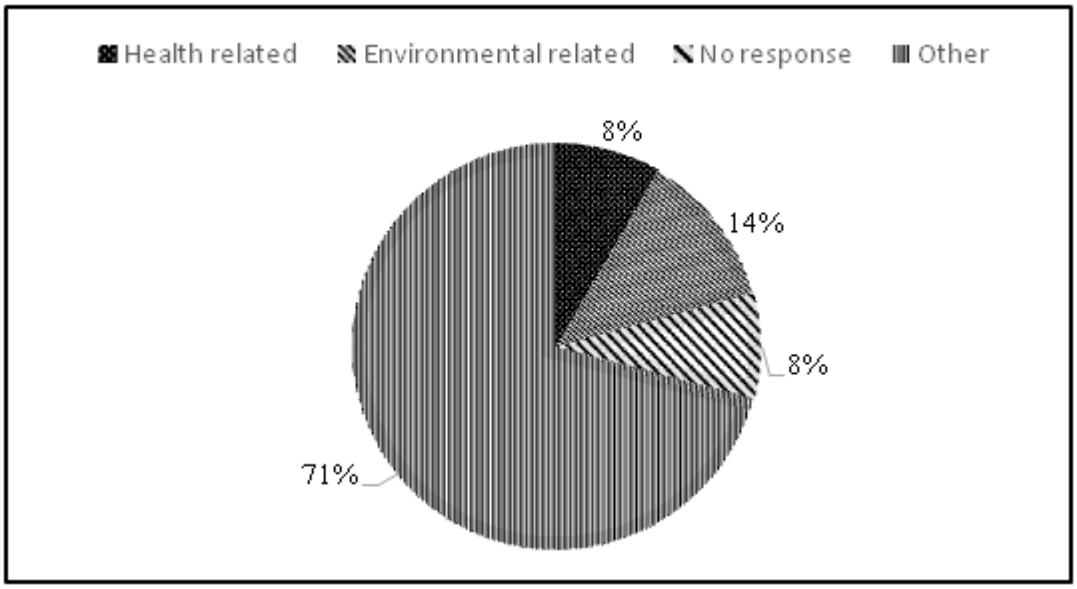

Figure 3. Reasons for Considering Computer E-Waste as Serious.

environmental considerations. This clearly indicates that most of the respondents do not know that computer e-waste has potential to negative impact on human health and environmental degradation of the urban area if not disposed of in an environmentally sound manner.

Public awareness about potential effects on human health and the environment of computer e-waste

Respondents were probed on the level to which they agreed with the axiom that “Some computer components and accessories contain harmful chemicals" to determine the degree of public awareness about harmful human health and environmental impacts of computer e-waste. Their responses were as presented in Figure 4 (n=48).

Figure 4 shows that overall, the majority of respondents from both households and institutions endorsed the claim that waste from computer components and accessories contain harmful chemicals (71.8% and 85.5% combined respectively). Only 14.1% and 8.4% in the household and institutions category of respondents respectively responded in the negative.

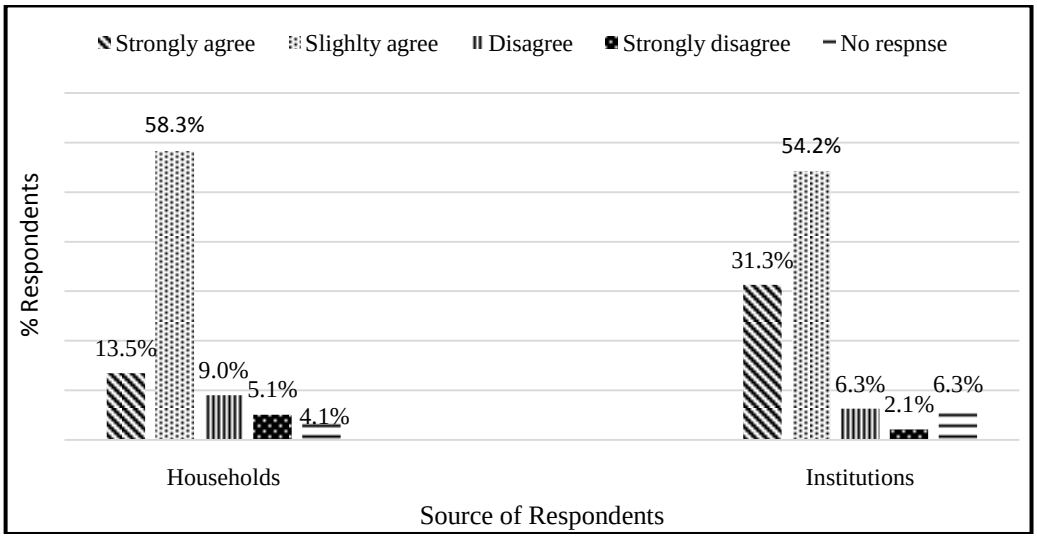

Figure 4. Agreement that Computer E-Waste is Harmful.

Table 1. Views on potential effects on human health and environment of improper computer e-waste disposal management approaches.

Respondents' view	Households		Institutions	
	Frequency	**Percent**	**Frequency**	**Percent**
Harmful	126	80.8	46	95.8
Not harmful	8	5.1	0	0.0
Uncertain	5	3.2	1	2.1
No response	17	10.9	1	2.1
Total	**156**	**100**	**48**	**100**

More specifically, the respondent's (from households and institutions) opinions on harmful implications of improper disposal of computers to the environment and human health of urban residents were sought. The responses to the question on this attribute were as presented in Table 1.

Table 1 shows that majority of the respondents from both households (80.8%) and institutions (95.8%) viewed improper disposal of computer e-waste as harmful to environmental quality and human health status of city residents.

To the supplementary question that followed, the respondents were asked to articulate how harmful improper disposal of computer e-waste is to the environment as well as to human health implications. The responses to this question were examined about how they resonated with the conceptualization of environmental sustainability and human health dignifying compliance in the study. In this way, they were resolved into three thematic typologies: accurate but not concise; accurate and concise, and not accurate. Thus classified, the responses were as presented in Table 2.

As Table 2 shows, slightly over half of the respondents from households were found to be able to articulate the environmental and human health ramifications of improper disposal of computer e-waste (62.2% and 52.6% respectively). This pattern of response was more pronounced in the case of respondents from public institutions in which 79.2% and 81.2% articulately pronounced environmental and human health risks in their judgments. The respondents from institutions also reported "accurate and concise" judgments on the environ-

Table 2. Judgments on potential human health and environment effects of computer e-waste.

Respondents' Judgments on	Households		Institutions	
	Frequency	**Percent**	**Frequency**	**Percent**
Environment				
Accurate but not concise	68	43.6	16	33.4
Accurate and concise	29	18.6	22	45.8
Not accurate	0.0	0.0	5	10.4
No response	59	37.8	5	10.4
Total	**156**	**100.0**	**48**	**100.0**
Human Health				
Accurate but not concise	68	43.6	14	29.2
Accurate and concise	14	9.0	25	52.0
Not accurate	0	0.0	3	6.3
No response	74	47.7	6	12.5
Total	**156**	**100.0**	**48**	**100.0**

Table 3. Suggestions for reducing potential harmful human health and environmental effects of computer e-waste.

Suggested action	% Respondents from households
Greater public awareness/attitude change campaigns	54.3
Intense government-led programmes	20.0
Strict enforcement of compliance with legal requirements	28.6
Close linkages with recycling plants	20.0
Promoting environmentally sound disposal methods	14.3
Promoting health responsive disposal methods	2.9
Enhancing the economic status of actors in the disposal chain	5.7
Expanding infrastructure for disposal practices	5.7

mental and human health implications (45.8%) and 52% respectively) than their counterparts drawn from households (18.6% and 9% respectively).

Asked whether they know the dangers of computer e-waste, one of the respondents living at the Dandora dumpsite had this to say: "*From what I know, burning of e-waste produces smoke that is dangerous and that there are alarming chest problems common in Dandora. However*, *I do not have another choice. Which one is better…to die of smoke or lack of food*?"

To further ascertain the centrality of awareness and attitudes regarding proper computer e-waste disposal approaches in the Nairobi City County, an open-ended question was posed in the questionnaire for households. It sought to enlist their opinions on appropriate options towards reducing the harmful effects of waste from computer components and accessories. To this end, the proposals solicited were as presented in Table 3 (n=48).

The corresponding magnitude of responses presented in Table 3 shows that creation of public awareness and attitude campaigns regarding computer e-waste disposal was the most outstanding suggested option for actions towards reducing the harmful effects of this waste (by 54.3% respondents from households). Focus on promotion of environmentally sound and human health responsive disposal methods was echoed in the responses of very few (from 14.3% and 2.9% households respectively). Notably, only 5.7% of respondents from households suggested that consideration of social economic conditions of the people engaged in e-waste collection within the city county would be useful. This is a viable option for reducing computer e-waste flow to urban solid waste streams and its attendant environmental and human health risks.

Besides, Table 3 shows that a substantial size of residents in Nairobi City ascribe to the position that the

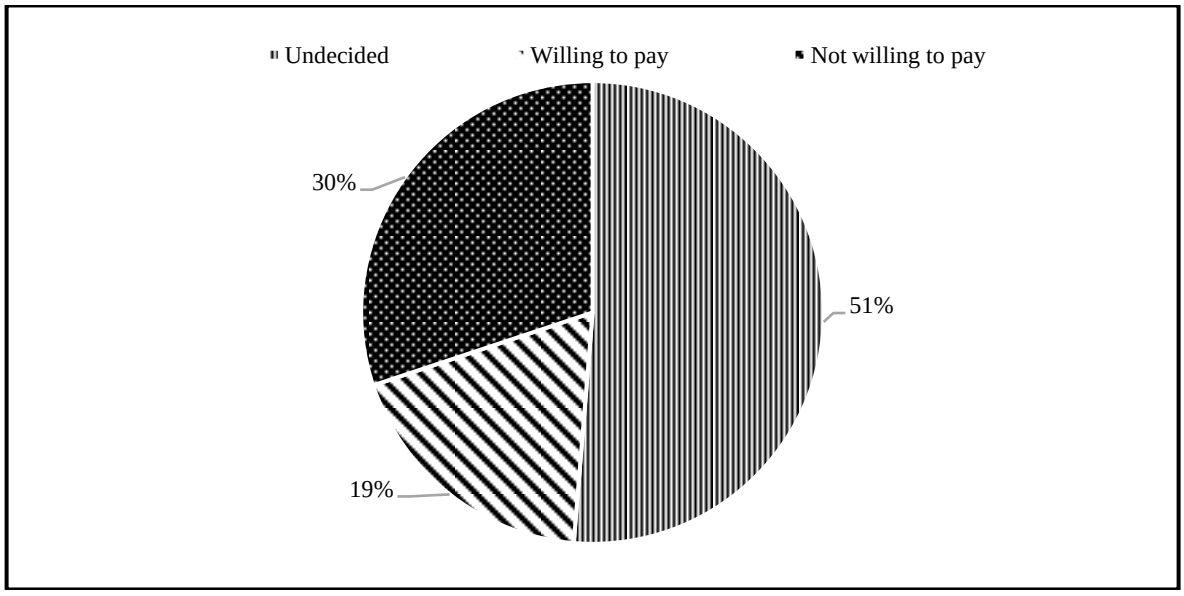

Figure 5. Willingness to pay for computer e-waste collection services.

government has a prime role to play towards decreasing the bulk of computer e-waste in the urban areas, either by way of formulating intense related programmes (20%), or through strict enforcement of legal requirements for disposal and management practices (28.6%), including those that close the linkage between disposal and recycling plants in the computer e-waste management loop (20%).

Willingness to Pay for Disposal Management Expenses

One of the widely documented current deterrents to sustainable solid waste disposal management in the cities of low-income countries is the dwindling financial capacity of the city administration authorities to maintain an effective and efficient solid waste disposal management system that cuts across the trajectories of the waste disposal loop. To this extent, residents have been prevailed upon or compelled to foot the bills relating to the disposal services for the waste they generate. In the same vein, this study sought to enlist from the households whether citizens would be willing to pay for the collection of the waste from computer components and accessories they generate. The responses were as presented in Figure 5.

As depicted in Figure 5, only a very few respondents from households (19%) pledged that they were willing to individually pay for the collection of computer e-waste from their houses. The rest were either undecided (51%) or were not committed to paying for this service (30%). Those who did not want to pay indicated that it is the task of the Nairobi City County to deliver the services free of charge since they spend on a service charge to the County Government.

Media for Public Awareness and Education

Given that this study was done in the contemporary world in which a wide range of mass media outlet technologies are available for enhancement of public awareness campaigns and education regarding human health and environmental issues in cities, this aspect was also included in the study. Respondents from households and institutions were presented with a wide range of options for transmission of messages and enabling education on waste from computer components and accessories in the questionnaire. These included electronic media outlets such as television, radio, internet, print media outlets such as newspapers and magazines, use of environmental groups, public forums and friends. They were also granted the liberty of indicating any other possible outlet that they would favour. Their responses to this question were as presented in Figure 6.

As presented in Figure 6, the majority of respondents (77.5% from households, and 52.1% from institutions) were of the view that a variety of media outlets could be used for public awareness and education campaigns about computer e-waste disposal in an environmentally sound and human health responsive way. This was followed with favour for the use of electronic media outlets by 33.3% and 16.7% respondents from households and institutions respectively. Resort to environmental groups as outfits for education and awareness raising campaigns on this subject was acknowledged by only a small size of respondents - only

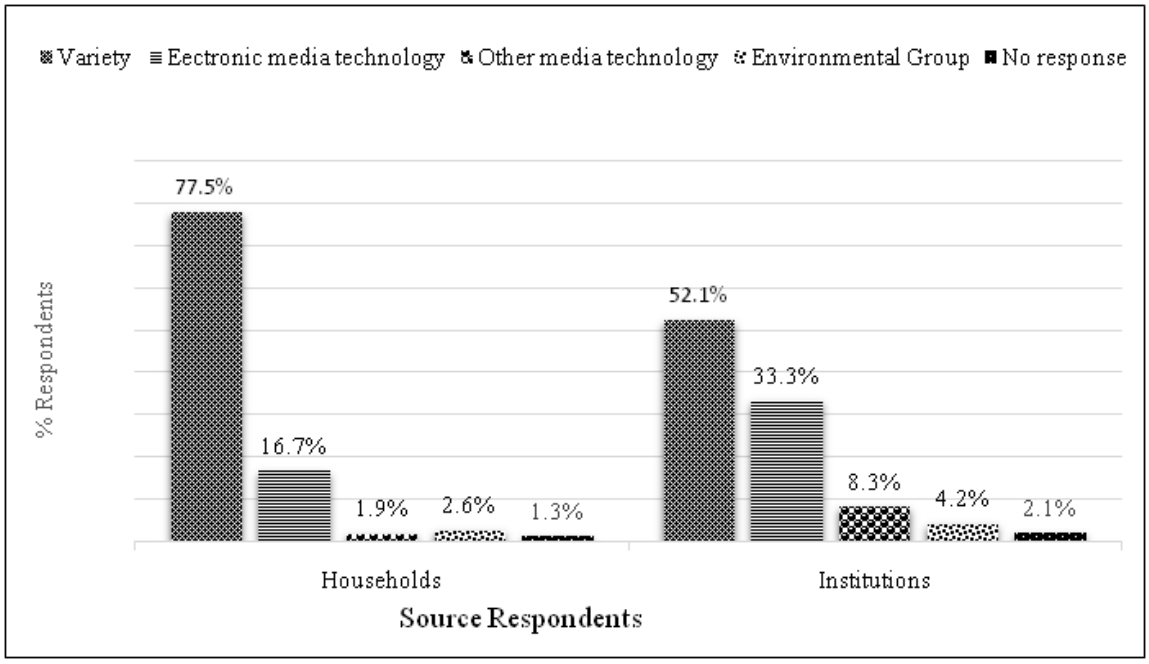

Figure 6. Suggested media for public education on computer e-waste disposal management.

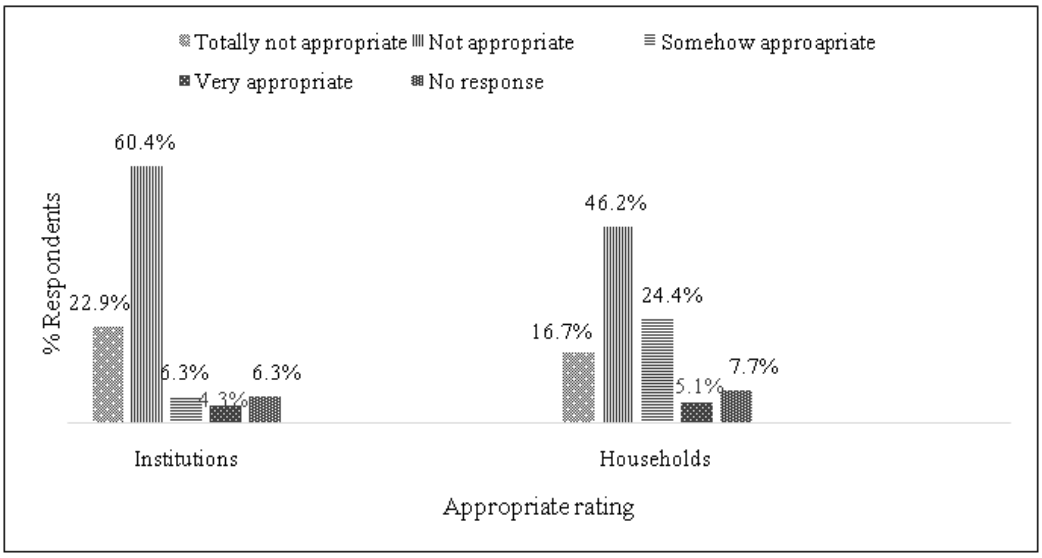

Figure 7. Considerations for disposal of computer e-waste with other wastes.

1 respondent from the institutions (2.1%) and 4 respondents (2.6%) from households.

Relative Perspective on Computer E-waste Disposal Management Approaches

The study also sought to unravel the perspectives of respondents regarding disposal of waste from computer components and accessories relative to the types of waste in the county solid waste stream. To this end, respondents from households and institutions were asked to rate, on a Likert scale, their thoughts on the appropriateness of throwing waste from computer components and accessories alongside other types of waste. Their responses to this question were as presented in Figure 7.

The responses presented in Figure 7 show that a sound majority of respondents from both institutions (83.3%) and households (60.9%) considered discarding waste from computer components and accessories alongside

other types of waste generated as not appropriate. Very few respondents from institutions (10.6%) and about one third (29.5%) from households thought that this practice was appropriate.

Observation of the dumping site revealed that burning of waste was used as a way of reclaiming valuable waste components such as copper wires. An interview with one of the waste pickers/scavengers indicated that once the copper wires, plastics and other metals are extracted from the computer e-waste, they are sold to the traders who operate within the dumping site and others who come from the nearby market (Ngala). A cross-check of one of the traders (yard shop operators) situated near the dumpsite indicated that they buy the materials such as plastics, metals from the waste pickers/scavengers who live at the Dandora dumpsite, sort them out by colour and type, wash, dry and package them for sale mainly to the local industries. Further, they sometimes sell to foreigners, mainly from China, who usually come to buy the metals from them at a higher fee than the local industries.

DISCUSSIONS

Computer e-waste is the outcome of human activities and therefore there is need for involvement of all public institutions, private companies and households in its disposal management. Despite the majority's consideration that waste from computers is waste from the institutions, they lacked the knowledge to link it with its impacts to human health and environmental risks if disposed of in an unsound manner. Hence the majority of respondents did not rate the gravity of concern to the computer e-waste flows to the environment as a serious problem in the urban area. This compares well with the conclusions by Saritha *et al*.,(2015), Nath *et al*., (2018), Iyer *et al.,* (2018) that consumers lacked knowledge of computer e-waste disposal management approaches. According to Anuj (2014), Patil (2016), the consumers also did not know the types of human health risks and environment-related hazards associated with improper disposal management of computer e-waste.

The fact that respondents gave other reasons for considering computer e-waste as serious instead of human health and environment-related is a clear indication that they were not aware of the consequences of human health risks and environmental degradation of the urban area. Similarly, UNEP, (2006), Robinson, (2009), and Widmer *et al*., (2005) observed that generation of solid waste had become a growing environmental and public health challenge everywhere in the world, especially in cities with low-economy. One of the aims of computer e-waste disposal management is to ensure appropriate disposal to improve the quality of the environment and minimize risks to human health.

The study established that despite the majority of the respondents at the household level having university education, a disposable income and more likely access to information regarding the cost and benefits of computer e-waste disposal management, they were unwilling to pay for the collection of the e-waste. This is contrary to the Tietenberg *et al.,* (2010) and Kariawasam *et al.,* (2006), on the theory of demand for environmental goods, which assumes that the higher the incomes, many years of schooling, the more the need for improved environmental quality. The Nairobi County scenario may be due to the perceptions that disposal management of computer e-waste is the preserve of the City County and Central Government and that the respondents do not have responsibility for disposal management of the computer e-waste they produce.

It may also be due to perceptions that the computer e-waste contains valuable components that could be sold to scrap metal collectors or the waste collectors. The results compares well with findings in Table 3 which show that a substantial size of respondents in Nairobi City County ascribe to the position that the government has an important role to play in reducing the bulk of computer e-waste in the urban area, either by way of formulating related programmes, or through strict enforcement of legal requirements for disposal management approaches, including those that close the linkage between disposal management and recycling plants in the computer e-waste management loop. The respondents lack knowledge that the computer e-waste disposal management is the responsibility of all consumers including the government for purposes of improving human health and the environment of the urban area.

Due to the perceived value of the computer e-waste, and unwillingness to pay for collection service, the respondents prefer to wait for waste collectors to buy instead of paying for the collection. This is the same reason advanced when the respondents store the computer e-waste in their houses and prefer that someone may come and purchase the e-waste from them without the knowledge that they are extending the lifespan of the computer components and accessories thus delaying their disposal in the landfill. This is a clear indication that the respondents lack the knowledge of the potential risks to human health and the environment and hence they do not want to contribute to the disposal management of the e-waste they produce.

Despite the harmful components in computer e-waste, there is low public awareness on the types of harm to human health associated with its improper disposal, Saritha *et al*., (2015) identified lack of awareness and capacity to disposal management of waste from computer components and accessories. Kalana, (2010) and Islam *et al*., (2016) established that there was low knowledge level on impacts of the e-waste on human health and the environment especially when they are disposed of together with county solid waste (CSW) at the end-of-life. This is because the respondents are still throwing away computer e-waste together with other

CSW and storing the computer e-waste in their premises instead of taking the waste to the recycling facility.

The level of public awareness on potential risks to human health and the environment by computer components and accessories was high in institutions than at the household level. According to Suja *et al.,* (2014), proper waste disposal management approaches by institutions is the development of internal disposal management systems. Melnyk *et al*., (2003) adjudge that the main aim of such type of management system is to ensure that the firm is able to reduce the waste from the computer components and accessories while at the same time improving on its overall performance.

These may be in form of environmental sustainability policies including the handling of computer e-waste in an institution, existence of environmental sustainability committees in both the public institutions and private companies. Despite this being a requirement under the public-sector performance contract, the study established that very few institutions and private companies had these displayed in their premises. This situation depicts the seriousness of human health and environmental concerns when it comes to impact from improper disposal management of waste from computer components and accessories in the institutions and private companies.

Asked if they perceive any human health hazards in dealing with computer e-waste, the management of the WEEE Centre said: *"Handling computer e-waste with inadequate safety gear while using inappropriate methods is a sure human health hazard due to some toxic elements that they contain. That is the reason why at the WEEE Centre, we provide for adequate safety gear and methods."*

Asked whether he is aware that the dumpsite has the potential to negatively affect human health and the environment, one of the respondents living a few metres from the Dandora dumpsite said:- "*Yes I know that this is possible and several people have complained of chest pains, but we do not have a choice because the City County has always said that the dumpsite would be relocated but we do not know when."*

Yet another respondent working at the dumpsite said: - "*Even if the waste at the site has potential negative impacts on human health and the environment, I have lived in this environment for over ten years and this is where I derive my livelihood."*

Another respondent living a few metres from the dumpsite said*: - "Relocation of the dumpsite should be to an area where there are no people so that the same problems would not be transferred to other people in another location."*

Observation of those working at the yard shops revealed that they sort out, wash, dry and bulk waste from computer components and accessories including plastics, motherboards and metals from computers, using bare hands. Asked, whether they know that the waste from computer components and accessories they handle may have potential to negative impact on their health, one person responded that: - "*I do not know and since I have done this work for over 5 years, I have not experienced sickness that I have associated with the handling of this waste."*

Besides, Table 1 shows that majority of the respondents from both households (80.8%) and institutions (95.8%) viewed improper disposal management of computer e-waste as harmful to environmental quality and human health status of city residents.

The study found that delay in purchasing new computers was not an option to computer e-waste disposal management. There was also an overwhelming majority of respondents from institutions and households who were in favour of having computer technology users engage in separation and transmission to recycling plants of waste from computer components and accessories.

The study established that there was a need to use various methods to adequately educate the public on human health risks and environmental degradation of the urban area. However, a variety of media outlets were the preferred choice for public education and awareness campaigns for both the institutions and the households. In addition, some of the respondents stated that the best way to get information on impacts of waste from computer components and accessories and its disposal management approaches was from the electronic media, environmental groups and other media technology. This mirrors the findings of the Shah community in Malaysia (Kalana, 2010).

Both the institutions and households consider as '*not appropriate'* to discard waste from computer components and accessories alongside other types of wastes generated but they do not relate this to the human health risks and environmental degradation of the urban area. It was observed that public awareness was the major one challenge in the computer e-waste disposal management. The situation is confirmed by Kalana, (2010) who established that many people are not aware of the potential negative impacts of computer components and accessories e-waste to human health and degradation of the environment mainly when washed into the solid waste stream at the end-of-life. The study established that more than half of the respondents (58.3%) '*Slightly agreed'* with the statement that some computer e-waste contain harmful chemicals while less than 15% '*strongly agreed'* that the e-waste contain harmful chemicals. Most of the respondents (56%), however, highlighted the greater need for public awareness/attitude campaigns and indicated the need for intensive government-led programmes.

The study, however, gave a strong indication that there is hope in the computer e-waste disposal management because there was evidence of the decreasing purchase and use of the desktop computers with the lead bearing CRT display monitors and increasing purchase and use of desktop computers with LCD monitors and Laptops.

This is also an indication that the potential risks to human health and degradation of the environment can sustainably be controlled for socio-economic development of the county and by extension the whole country.

Analysis of the data on the level of knowledge and public awareness on the impact of computer e-waste on human health and the environment of the urban area concluded that there is a low level of awareness and insufficient knowledge of toxic components in computer e-waste and therefore the respondents are exposed to serious health hazards. The respondents do not know the proper computer e-waste disposal management approaches. This explains the reason why respondents stored computer e-waste in their houses and offices and also threw the computer e-waste together with other urban solid waste. Besides, the respondents lacked information on where and how to dispose of the same in an environmentally sound manner (Macauley *et al*., 2003). The study has revealed that the respondents who stored or threw away the computer e-waste with other wastes do not know how to and where to dispose of the waste from the computer equipment. The respondents' level of awareness is assumed to be related to the approaches and attitude on computer components and accessories disposal management at the end of life (EoL). The study concludes that the respondents who knew how to dispose of the computer e-waste also knew that the e-waste is hazardous.

CONCLUSIONS

Despite most respondents having attained university education, the analysis of the data on the level of public awareness of the impact of computer e-waste on human health and environmental degradation of the urban area is low. Besides, knowledge of toxic components in computer e-waste is insufficient or lacking completely, and therefore the respondents are exposed to serious human health hazards. This is an indication that public awareness on proper computer e-waste disposal management approaches and information on the potential hazards and how to dispose of the same in an environmentally sound manner is lacking. The respondents, therefore, were found to store the computer e-waste in their houses and offices or threw away the same together with other CSW.

This scenario is also echoed by Schmidt (2002, 2006) who noted that the current awareness regarding the existence and dangers of e-waste are extremely low in developing countries than in developed countries. The respondent's knowledge level is presumed to be related to the practice and attitude on computer components and accessories disposal management at the EoL partly because even when sensitization and awareness on e-waste are carried out, the stakeholders are often unwilling to participate in their disposal management. The study assumed that the respondents who know that computer e-waste is hazardous and can negatively impact on their health and environmental degradation of the urban area, also know how to dispose of the computer e-waste. This is attested by the high accumulation of waste from computer components and accessories in homes and offices and low concern on the gravity of the computer e-waste flows to human health and the urban environment.

The respondents were also found to lack knowledge that responsibility of computer e-waste disposal management is a responsibility for all stakeholders and not the County Government alone. Likewise, the respondents living at the vicinity of the dumpsite, though aware of the potential effects of the waste from computer components and accessories on human health and the environment were found to value economic aspects of the e-waste as opposed to toxic effects on their health. No organized public awareness programmes were identified.

The study concludes that there is need for public awareness programmes to sensitize computer users on the risks and dangers of computer e-waste and the appropriate ways of disposing of the waste. There is also need for a coordinating body – e.g. County Computer E-waste Authority or Agency - whose mandate will be to coordinate all issues of computer e-waste including disposal approaches, public education and awareness campaigns on the effects of e-waste on human health and environment; the need to segregate; and why the e-waste should not be thrown away together with CSW through various media outlets to all stakeholders in the county.

RECOMMENDATIONS

The proposed County Computer E-waste Authority will make deliberate efforts to enhance public awareness creation on safe handling of the computer e-waste at the disposal stage through deliberate and specific outreach programmes. The information should be made available through appropriate means (e.g. websites, workshops/seminars, campaigns, media, environmental NGOs by identifying target groups with tailor-made solutions towards sustainable computer e-waste disposal management. Such outreach programmes should include the need to segregate the waste from computer components and accessories from the non-hazardous wastes. There is a need for establishment of a sustainable computer e-waste disposal management system and gazettement of designated strategic drop off residential/commercial points, wards computer literacy centres and county computer e-waste recycling centres for ease of collection of obsolete computer components and accessories.

ACKNOWLEDGMENTS

This work was supported by the National Commission for Science, Technology and Innovation (NACOSTI), Kenya.

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