

Computer E-waste Disposal Management Approaches: A National Crisis

Action needed now to stop human health and environmental disasters

Overview

Computer electronic waste (e-waste) is the swiftest growing solid waste stream in the world. It is one of the highest problematic components of the solid waste streams in urban areas [1]. It is a risk to human health and the environment because of the hazardous nature of its contents. The voluminous computer e-waste generated creates a major disposal management challenge especially in the low-income countries of the world. Information on how these countries are disposing of their computer e-waste is lacking. It is also not clear how knowledgeable consumers and marketplace actors in e-waste uphold the potential human health and environmental hazards presented by unsustainable disposal management approaches for this type of waste. This study was conceived to generate information on the same.

This policy brief identifies the computer e-waste disposal management approaches; determines the potential effects on human health and environment; evaluates the level of public awareness on potential effects on human health; and possible planning, policy and regulatory interventions for sustainable computer e-waste disposal in the public institutions, private companies and households.



Computer e-waste in one of the public institutions

What is happening and why?

There are rampant trans-boundary transmissions from high-income countries to low-income countries in Africa [2,3,4,5,6]; increase in domestic computer e-waste; decreasing consumer costs; saturation of

global market for computers; shortening of life-spans [7] which has resulted in faster obsolescence of the products [8]; rapid technological innovations; changing consumer lifestyles and preferences; and introduction of new products and product types [9]. The challenges of computer e-waste are that respondents at the informal sector dismantle the computer e-waste without protective gear thus endangering themselves and their families. Other challenges of computer e-waste disposal management (CEDM) include poor implementation, monitoring and evaluation of environmental standards; high poverty levels [10,11] inadequate CEDM infrastructure and technical capacities [12,13,14].

Recycling of computer e-waste is touted in a vast body of literature and environmental management discussions as a viable route to solutions to the problem of the increasing e-waste stream. Some studies (EMPA), have indicated that computer e-waste could be reused, refurbished, or recycled in an environmentally sound manner so that their end-of-life (EoL) status are less harmful to human health and the environment. [15,16] have noted that certain valuable materials such as plastic or iron parts, copper-containing motors, copper bearing printed wiring boards, silver and gold contained in waste from computers make them worthy of recycling. However, the successful pursuit of recycling is still a distantly situated solid waste management option in low-income countries' urban settings.

Several fundamental scenarios shape up the elusive character of sustainable routes to e-waste disposal management. First, recycling plastic is the most challenging component of electronic equipment [17] because it is difficult to make recycled plastic pure enough to be useful. Besides, separating plastics in electronics also remains a major challenge for many actors in the waste management domain. Second, the computer components and accessories are often not clearly labeled and small amounts of incompatible plastic may contaminate any batch of

material [5]. Third, a major problem associated with poor CEDM includes potential risks to human health and the environment causing diseases such as cancer, neurological, respiratory disorders and birth defects [18] and environmental degradation respectively.

Key Research findings

Computer e-waste disposal management approaches

The study established that different types of CEDM approaches are practiced by the public institutions, businesses and households [19]. These are public auctions, throwing away with other County solid wastes, recycling, selling as secondhand materials, selling to the recycling facility, open burning, leasing and urban mining.

Computer e-waste auction disposal approach by public institutions was found to be one of the riskiest as far as potential effects to human health and the environment are concerned. This is because e-waste is purchased by the informal sector where valuable components of the e-waste are extracted with no regard to human health and the environment.



Figure 1: Computer e-waste disposal management approaches by institutions and businesses

Potential computer e-waste disposal management on human health and the environment

The study observed that all the disposal management approaches practiced by the different stakeholders are unsustainable because they have direct or indirect potential effects on human health and the environment if they are not disposed of in an environmentally sound manner [20].

The Public Procurement and Asset Disposal Act [21] was found to make available the broken down and unserviceable computers to the informal sector, where the same is dismantled using crude tools without any regard to human health and degradation of the urban environment.

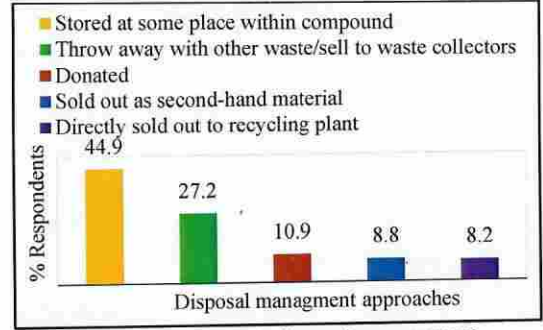


Figure 2: Computer e-waste disposal management approaches employed by households

The broken down and unserviceable computer e-waste remaining after the public auctions were thrown away into the landfill where they weather and release toxic materials such as cadmium, lead and mercury into the water sources, contaminates soils and pollutes the air thus directly and indirectly impacting on human health and the urban environment negatively.

The process of extraction of valuable materials from computer e-waste through open burning was found to expose the workers and respondents living close to the vicinity of the dumping site to toxic chemicals thus compromising their health and degrading the environment through pollution of air, soils and water sources.

Leasing of computers was found to remove the potential effects on human health and the environment from the respondents since ownership is retained by the vendor until the specified time (usually 3 years for the private university). Urban mining was found to reduce the potential effects on human health and the environment of computer e-waste. The very unfortunate situation in the low-income countries is that risks to human health and the environment will continue due to the hidden flow of computer e-waste from high-income countries and the existence of unsustainable CEDM approaches.

Level of public awareness on effects of computer e-waste disposal management approaches on human health and the environment

Despite most respondents having attained university education, the level of awareness on the impact of computer e-waste on human health and environmental degradation of the urban area was low. The knowledge of toxic components in computer e-waste was insufficient or lacking completely. This is an indication that the respondents lack awareness on the effects of computer e-waste on the environment and hence proper disposal

management approaches [22]. This might be due to lack of information on the potential hazards and how to dispose of the same in an environmentally sound manner. As a result, the respondents were found to store the computer e-waste in their houses and offices or threw it away together with other county solid waste. This scenario is also echoed by Schmidt [5] who noted that the current awareness regarding the existence and dangers of e-waste are extremely low in low-income countries than in high-income countries. The respondents' knowledge level is presumed to be related to their attitude on computer e-waste disposal management approaches 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 negatively impact on their health and the urban environment also know how to dispose it off. 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 CEDM is a responsibility for all stakeholders and not the County Government alone. Likewise, the respondents living at the vicinity of the dump site, though aware of the potential effects of the e-waste on human health and the environment were found to value economic aspects of the e-waste as opposed to toxic effects on their health.

Policy recommendations

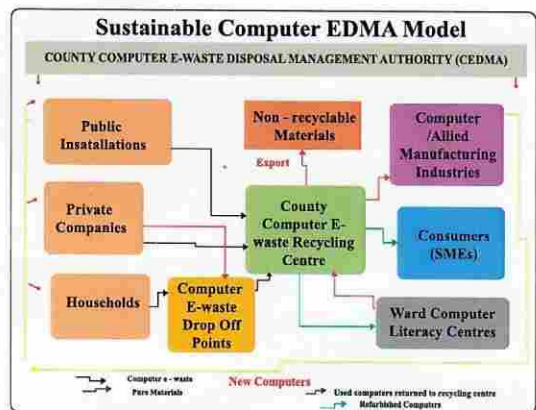
Review of the public procurement and asset disposal act [23] to provide for disposal of all computer e-waste from the public institutions and businesses at the proposed CEDM recycling centre [24].

The key to success in terms of CEDM is to develop eco-designed devices, recover and recycle materials in an environmentally sound manner, dispose of e-waste by best available technologies (BAT), forbid the imports/transboundary movements of computer e-waste to the country, and raise public awareness of the impact of computer e-waste to human health and the environment.

From the modeling exercise [24], it is recommended that a County E-waste Management Authority (CEMA) or a department be created at the Communication Authority of Kenya or City County of Nairobi to implement a Zero Computer E-waste Policy (ZECEP). Others are introduction of a 2-level

model of a CEDM system that will include: i) residential, commercial and neighborhood computer E-waste Drop Off Points (CEDOPs) and ii) a County Computer E-Waste Recycling Centre (CEREC). The CEDOPs should be spatially located in strategic locations in every residential, commercial and neighbourhood. The study also recommends the establishment of Ward Computer Literacy Centres (WaCoLiCs) in all Wards for Community Computer Literacy Capacity Building. These centres will absorb some of the recycled products to benefit communities. The County will enter into collaborations with countries with Best Available Technologies for disposal of unrecyclable components of the e-waste.

A national scheme such as Extended Producer Responsibility (EPR) is also a good policy in solving the growing e-waste problems. However, no single tool is adequate but together they can complement each other to solve the increasing CEDM challenges.



The Authority will develop and implement public awareness and capacity building programmes for CEDM and make information available through appropriate means. Such outreach programmes should include the need to segregate the computer e-waste from the non-hazardous wastes. The programmes would also include the information on where to take the computer e-waste at the end-of-life.

The study also recommends the domestication of the Basel and Bamako Conventions; implementation of the extended producer responsibility; formulation and enforcement of the current management plans, policies and legislation for CEDM.

In recognizing the emerging roles of various stakeholders, the County will engage public-private-partnerships (PPP) in order to build a strong and sustainable infrastructure to facilitate an environmentally sound CEDM system.

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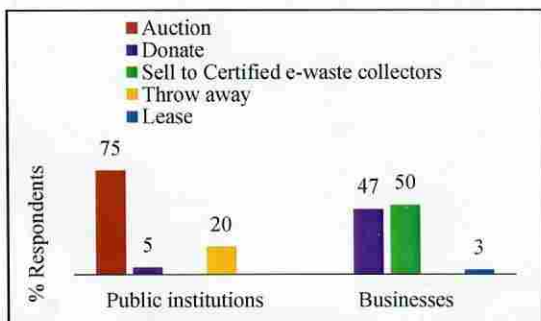


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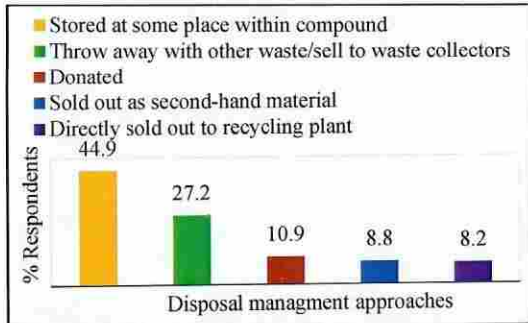


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Similar studies should be undertaken in all counties of Kenya to quantify and generate information to facilitate planning for and implementation of sustainable CEDM systems.

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