TECHNO-ECONOMIC ASSESSMENT OF E-WASTE MANAGEMENT SYSTEM IN SOUTHWESTERN, NIGERIA

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Abstract

The fastest growing waste stream is electronic waste especially in developing economies. About 80% of this waste is brought to Asia and Africa for possible disposal by the industrialized countries. In Nigeria, due to quest for new electronic devices and equipment most of these wastes find their ways into the country. Also, large percentage of this imported electronics are not serviceable thereby contributing to the municipal waste. The compositions of this e-waste are categorized into hazardous and non-hazardous. The hazardous substances from the e-waste pose as a threat to human health and agricultural soils; while non-hazardous contains precious metals that can be recycled for economic benefits. This study therefore examines the e-waste management system available in southwestern Nigeria taking into consideration the techno-economic values. With the aid of personal interviews, on-spot assessment and content analysis, a number of challenges were established. It was observed that there is no formal system for managing this e-waste in southwestern Nigeria. However, the study proposed a framework for sustainable e-waste management system.
Keywords: E-waste, Metals, Management system, Technology, Economy

Introduction

The need to develop a responsible e-waste management system in Nigeria is of utmost importance. The poor level of e-waste management in Nigeria is a serious concern as it constitutes environmental nuisance and thus hazardous to health. In developed countries the management of e-waste is given a top priority but in most third world countries it is difficult to replicate such despite the fact that the amount of e-waste generated in these countries keep on growing on daily basis (Sushant et al., 2010). Nigeria generates more e-waste than they can manage, and this situation tends to increase with rise in income levels, quest for new electronics and the economic development of the nation.

E-waste production is on increase and at an alarming rate, especially in Nigeria where we do not have the proper funds or sustainable system to manage it. Many developed countries find it cheaper and more convenient to ship their e-waste to Africa, which only adds to the amount of e-waste undergoing unsafe disposal. Research reports that approximately 80% of the e-waste of developed countries is exported to poor or developing countries (Schmidt, 2006). Nigeria ranks among the top ten importers of e- waste after China. In Africa, Nigeria is leading and followed by Ghana (Robinson, 2009). Without proper disposal of the waste generated from electronics, chemicals such as lead, arsenic, chromium,

and dioxins may leach into the environment, causing environmental degradation and pose a threat to humans and animals in the vicinity (UNEP, 2009). Unsafe disposal of e-waste is a growing problem and the environmental effects and human health hazards are very serious; a plan needs to be established to address this issue and avoid the consequences (Park et al., 2017; Violet, 2008). It is worthy of note that Nigeria currently generates between 650,000 and 1,000,000 tons of domestic e-waste annually (TERRA, 2016). More than 60% of this e-waste is from southwestern, Nigeria (TERRA, 2016).

E-waste management system
The available structures for e-waste management vary from one country to another. The two major types of e-waste recycling methods that are used throughout the world are formal and informal e-waste recycling. Formal recycling primarily occurs in more developed countries due to the increase in the costs necessary to use this method. It costs more money to recycle the e-waste properly in a formal facility than to recycle the e-waste informally. Informal recycling facilities are primarily used in developing nations. Spain has a more prominent system for managing e-waste which has been tested and found to be effective (Queiruga et al., 2012). This system is driven by a policy. However, Queiruga et al. (2012) identified recycling infrastructure and the presence of too many unregistered manufacturers as one of the major challenge of this e-waste management structure.

In some other developed countries, e-waste management systems are comprised of three components: the national registry, collection systems, and logistics. The registry can be monitored by a variety of agencies and is essentially a list of e-waste

The management of E-waste in Southwest, Nigeria has not received adequate attention despite the fact that there is national legislation for e-waste management. To make the national policy more effective, Lagos state developed its own e-waste Policy to assist and engage more strategic approach in handling e-waste management issues (LASEPA, 2012). This policy was intended to guide the State and other stakeholders on the implementation of collective measures to address the challenges and opportunities of e-waste, for the benefit of the nation. This paper therefore, assessed the e-waste management system alongside the existing legislations. producers with attached collection obligations. As for collection, there are two main types for e-waste in developed countries: collective systems and clearing house systems (Sthiannopkao, 2012). In the clearing house collection system waste businesses, producers, and recyclers all participate with the hopes of providing their services. As for the logistics of e-waste disposal there are three main avenues: collection by municipal collection sites, in-store retailer take-back schemes, and direct producer take-back (STEP, 2009). Once the e-waste is collected dismantling, pre-processing, and end processing occur to ensure safe disposal or recycling of e-waste. Dismantling and pre-processing only require minimally skilled workers capable of performing mechanical processes with drills and wrenches. End-processing requires highly skilled workers and complex equipment such as integrated metal smelters which can be very costly. These intricate systems have been designed such that the handling and disposal of e-waste has minimal impact on the environment (STEP, 2009).

Techno-economic analysis of e-waste management system in Nigeria

E-waste contains deposits of precious metal estimated to be between 40 and 50 times richer than ores mined from the earth, according to the United Nations. Out of this only 10-15 percent of the precious metals in e-waste is successfully recovered while the rest is lost (LeBlanc, 2017). This e-waste also contains toxic substances such as lead, mercury, cadmium and chromium which if not properly disposed or processed could be harmful. Proper processing is indispensable to ensure that these materials are not released into the environment.

In Nigeria, recycling of e-waste involves using crude methods; it handles about 80% of the e-waste (Fig. 8.1.4.1). The activities involved in this recycling process are shredding, burning, and dismantling the products. Most times these activities are found in backyards shanties and dumpsites. This informal way of managing e-waste which is prominent in Nigeria should not be encouraged because emissions from these recycling practices are damaging to human health and the environment. Formal way of recycling (Fig. 8.1.4.2) is not common in Nigeria despite the legislation in place for managing e-waste. This is the proper way of recycling, taking, Health, Safety and the Environment into consideration.

Fig 8.1.4.1: Informal way of handling e-waste
Source: http://www.mdx.ac.uk

Figure 8.1.4.2: Formal way of recycling e-waste
Source: http://www.weeecentre.com/) (WEEE) Centre

The current E-waste management scenario in Southwestern, Nigeria indicates that there is no organized or formal setting for handling the waste. There is no visible oraganised collection centers. Most of the wastes are disposed along with other wastes. It is also observed that there is no recycling facility to cater for this waste. The available legislation to drive the e-waste management in a more formal way is not effective. This legislation could only be effective if government involve all the importers of this electronics in its quest to manage the waste. The informal sector should also be enlightened on the environmental and health effects of improper e-waste management.

Framework for managing e-waste in south-western Nigeria

Figure 8.1.4.3 shows the conceptual framework for managing e-waste in southwestern, Nigeria. It has government at centre indicating that government has the major role to play. To achieve a sustainable e-waste management government should support for the stakeholder in the business of e-waste management, the support should be in form of funding and policy implementation. The need for government to establish collection centers, provide waste recycling infrastructure and e-waste management structure is indispensible in achieving a sustainable and effective e-waste management system. There is also the need to involve those that import these items into the country on how to manage the waste their importation could generate.

Environmental agencies should be encouraged to live up to standard in managing e-waste. The legislation for collection, recycling and disposal should be enforced. This is the only way the e-waste could be properly managed. However, the need to educate people on the need to properly dispose their e-waste is very important as most people do not know the health implication and the benefit therein. Formalizing the informal recycling sector by the government through legislation and funding will also go a long way in re-position of e-waste management system.
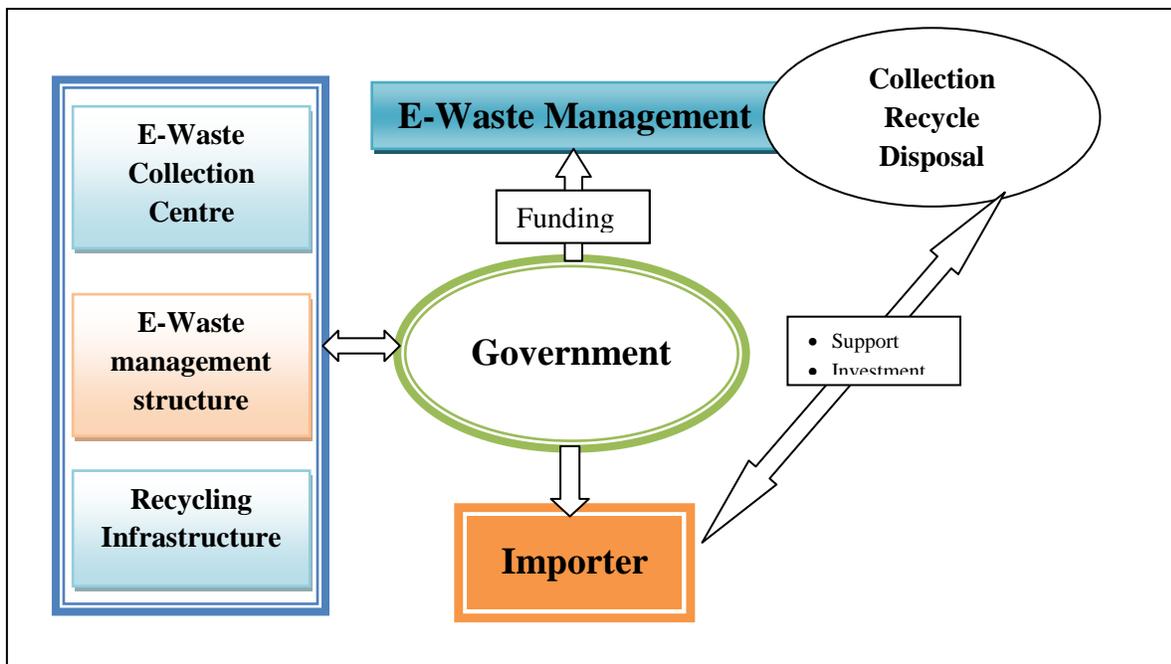
Figure 7.1.4.3: Conceptual framework for managing e-waste

Conclusion

Nigeria needs sustainable policy interventions in managing e-waste, implement and formalizing the informal sector. These will help in promoting adequate e-waste management system. Adopting the conceptual framework will enhance a clear legal framework for e-waste collection and recycling. Moreso, enforcing legislation on the importers will reduce the rate of importing electronic scrap into the country.

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