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E-WASTE MANAGEMENT SYSTEM: NEGROS ORIENTAL STATE UNIVERSITY, DUMAGUETE CITY, PHILIPPINES

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ABSTRACT

Electronic waste or e-waste is one of the fast growing problems of the world. Some e-waste contains toxic substances that could be dangerous to human health and the environment (Pinto, 2008). City Ordinance 115 or the Integrated Solid Waste Management of Dumaguete City mandates the segregation of solid waste into biodegradable or decomposable, non-biodegradable or non-decomposable, and hazardous wastes. The ordinance has been in effect since 2000, after Republic Act 9003 or the Ecological Solid Waste Management Act. This paper evaluated the e-waste management practices at Negros Oriental State University (NORSU) system.This study used the descriptive method. Results reveal that there is no committee in e-waste management that can deal with the impending influx of electronics. It was concluded that a committee on e-waste management should be organized so that a policy will be formulated.

KEYWORDS: Technology, Descriptive, E-Waste, Philippines

INTRODUCTION

Electronic waste, or e-waste, is a term for electronic products that have become unwanted, non-working or obsolete, and have essentially reached the end of their useful life. Due to fast technological advancement, many electronic devices become “trash” after a few short years of use.

According to Johri (2008), e-waste is one of the fastest growing waste streams in the world. Some of the notable items under this category include personal computers and mobile phones. The technical innovations and rapid change in the models of these entities have generated huge quantum of wastes.

Kishore (2010) affirmed that the quantity of “e-waste” or electronic waste has now become a major problem. Disposal of e-waste is an emerging global environment and public health issue, as this waste has become the most rapidly growing segment of the formal municipal waste stream in the world. Sales of electronic products, most notable information technology and telecom (IT) equipment have steadily increased over the past 20 years (Brown-West,2010).

The composition of e-waste is very diverse and differs in products across different categories. It contains more than 1000 different substances, which fall under ‘hazardous’ and ‘non-hazardous’ categories. Some e-waste contains toxic substances that have an adverse impact on human health and the environment if not handled properly. Often, these hazards arise due to the improper recycling and disposal processes used. It can have serious repercussions for those in proximity to places where e-waste is recycled or burnt (Robinson, 2009).

Salleh (2013) revealed that the director of the Croucher Institute for Environmental Sciences, Professor Wong said that “ he would call e-wastes as a global time bomb, referring to the growing pile of waste produced by old mobile phones, computers and other electronic devices. As much as 50 million tons of hazardous e-waste is being produced a year and only a small fraction of this is safely disposed. In a personal computer, for example, there may be lead in the cathode ray tube (CRT) and soldering compound, mercury in switches and housing, and cobalt in steel components, among equally toxic substances (Rouse, 2007). In many instances, the only visible part of an electronic product is its outer shell. Unless that casing is broken, we rarely see the myriad circuit boards, wiring and electrical connections that make the device actually function. But those valuable inner mechanical organs are toxic in nature. A whole cluster of heavy metals and other chemical compounds lurk inside your seemingly innocent laptop or TV.

E-waste dangers stem from the ingredients such as lead, mercury, arsenic, cadium, copper, beryllium, barium, chromium, nickel, zinc, silver and gold. Many of these elements are used in circuit boards and comprise electrical parts such as computer chips, monitors and wiring. Also, many electrical products include various flame-retardant chemicals that might pose potential health risk (Toothman,2001).

A study at Rwanda on “Sustainable E-Waste Management: Using the Framework for Strategic Sustainable Development (FSSD) in a Case study at National University of Rwanda (NUR)” which was conducted by EceUtkucan, Matthew Lobach and Wyeth Larson of Blekinge Institute of Technology at Karlskrona, Sweden explores how to apply an approach of strategic sustainable development to e-waste management through a case study at the NUR. Interviews and surveys were conducted, and workshops and presentations were hosted during a site visit to NUR. No e-waste management system is in place in Rwanda, while the country is working to increase ICT capacity. At NUR, awareness of e-waste challenges is low, and management currently consists of storage and limited low-tech pre-processing. Suggested actions were prioritized and delivered to NUR in an action plan under three project categories: project core, e-waste management, and e-waste education and research with the aim of establishing a pilot project of e-waste management to make NUR an e-waste leader. A Framework for Strategic Sustainable Development was used to ensure e-waste is managed in a strategic way that leads to an e-waste management approach that could exist in a sustainable society. This research concludes that strategic sustainable e-waste management is possible at NUR and presents six theme areas to guide the development of an e-waste project with a systems perspective.

A study by Wisdom Kanda and MesfinTaye at Gaborone, Botswana entitled E-waste Management in Botswana explores on the existing e-waste management practice through systematic investigation of the current circulation, usage, handling and management of WEEEs (Waste Electrical and Electronic Equipment). Several stakeholders in the solid waste management system were interviewed and also in the site (on the landfill) waste composition study was conducted in line with the aims and objectives of the research. The study finds that WEEEs do not have exclusively designed management structure in Gaborone and they rather flow source to sink usually blended with the general waste derived from the entire socio-economic activity. Waste composition study conducted on the landfill indicates a very low percentage composition (less than 1%) of WEEEs in the junk corresponding to 1.9 kg/capita/year. Substantial amount of obsolete EEEs rather seem to linger in the socio-economic system until a capable tapping mechanism is installed. An integrated e-waste management system centered around public sensitization and the novel phenomenon of Enhanced landfill mining which simultaneously offers time to consult developed countries for expertise on sustainable WEEE management is proposed. The impetus to close the linear flow of electronic materials remain with the government and a range of stakeholders/interest groups who seek to gain economic advantages and also trim down environmental implications from the circulating and landfilled

W(EEEs).

A study by Sharon M. Manalac of the University of the Philippines entitled “Electronic Waste: A Threat in the future” explore on the e-waste in the Philippines. She posited that in the Philippines, the legislation governing solid wastes is the Republic Act of 9003 or the Philippine Ecological Solid Waste Management of 2000, but there are no clear and specific guidelines regarding electronic wastes. The country is experiencing major problem on finding a suitable location for the disposal of Metro Manila garbage, much more with the booming of the e-wastes.

The Philippines needs to develop long term solutions for the abatement in the harmful effects of the e-wastes. The public should be provided with information with regards to e-waste. The government should provide a facility and mechanism in which e-waste could be collected. Legislation and policy is an important factor that will push more products to be treated in an environmentally sound way. Policy is the instrument of change. There should be a shared responsibility between the consumers and producers of electronics -those who create and use the electronics must be responsible for the wastes they produce.

With these issues pertaining to e-wastes, particularly on health, there is a pressing need to address e- waste management. The unsafe and environmentally risky practices adopted pose great risk to health and the environment (Shiga,2007). E-waste management provides guidelines for selecting the most environmentally desired methods for managing a waste stream. E-waste collection programs need guidelines to assure that products are managed in a way that protects public health and the environment and conserves valuable resources.

Republic Act 9003 or the Ecological Solid Waste Management Act aims to establish segregation among garbage and wastes nationwide. Despite the proliferation of various laws, rules and regulations governing disposal of property, a considerable quantity of unserviceable, no longer needed, obsolete, forfeited/seized, supplies, materials and equipment and valueless records which have grown into unmanageable and uneconomical proportions now exist in the various government agencies. To save on cost of maintaining such property there is a need for their disposal (COA Training handbook on Property and Supply Management System, 2011).

Pursuant to Executive Order No. 888, Sec 1 and COA Cir. No. 89-296 the full and sole authority and responsibility for the divestment or disposal of properties and other assets owned by the National, Corporate and Local Government Units including its subsidiaries shall be lodged in the heads of the departments, bureaus and offices or governing bodies or managing heads of the concerned entities (COA Training handbook on Property and Supply Management System, 2011).

The primary focus of this study is to evaluate the e-waste management practices at Negros Oriental State University system. Surveys were conducted on the nine campuses of the university system. Different e-waste management practices in terms of collection, handling and disposal were evaluated. Reusing, recycling and reducing of e-waste were also evaluated. Issues and concerns faced by the university system on e-waste management were also identified.

METHODOLOGY

This study used the descriptive method of research utilizing a questionnaire to collect information. This questionnaire was patterned after the study conducted by Utkucanet. al. (2010).

The study covered nine (9) campuses which are strategically located in the entire province of Negros Oriental State (refer to Figure 1).These campuses include Guihulngan campus, situated in the northern part of the province, 117kms from the capital city of Dumaguete;Bais campuses 1&2, 47 kms north of Dumaguete; Main campuses 1&2, at the center of Dumaguete City; Siaton Campus,50 kms south of Dumaguete; Bayawan-Sta Catalina campus, 99 kms south of Dumaguete;Pamplona campus, 38 kms north-west of Dumaguete; and Mabinay campus, 87.5 kms from Dumaguete and, located at the interior part of the province. Figure 1 below shows the location of satellite campuses in NORSU.

Purposive sampling is being used in this study. The respondents are people who are directly in-charge of any e-waste accumulation in NORSU system. Respondents for the surveys were the campus administrator, supply officer, computer instructors, administrative officer, building and grounds director, canteen-in-charge, deans, property custodians, culinary instructors and laboratory instructors.

The data gathering instrument that was used in this study was questionnaire. This questionnaire was patterned after the study conducted by Utkucanet. al. (2010) with the title “Sustainable E-waste Management: Using the FSSD in a Case Study at NUR”.

The questionnaire evaluated e-waste management practices at Negros Oriental State University System during the Calendar Year 2014.

This study used simple percentage and weighted mean.

Figure 1: Location Map of the Research Environment

RESULTS

In this section of the paper, the data are shown in tabular forms which show the e-waste management practicesimplemented at NORSU as to collection, handling and disposal, e-waste management in terms of 3Rs (Recycling, Reusing and Reducing) and the issues and concerns on e-waste management encountered in NORSU system.

E-waste Management Practices

Table 1 shows e-waste management practices implemented by NORSU in terms of collection**.**

Table 1: E-Waste Management Practices Implemented by NORSU in Terms of Collection

Collection	Mean	Verbal Description
Students bring e-waste to the teacher-in-charge	1.50	Less Implemented
Teacher brings e-waste to the supply office	5.00	Highly Implemented
Supply office collects e-waste from different offices	4.00	Implemented
Take back policy by the supplier	1.00	Least Implemented
Yearly collection of e -waste from each department	1.00	Least Implemented
Average	2.5	Less Implemented

It shows that the collection method where teachers bring e-waste to the supply office is highly implemented in the institution. And it also shows that the different collection methods of e-waste at NORSU system are less implemented.

Table 2 shows e-waste management practices implemented by NORSU in terms of handling.

Table 2: E-Waste Management Practices Implemented by NORSU in Terms of Handling

Handling	Mean	Verbal Description
E-waste are directly put in the trashcan	1.00	Least implemented
E-waste are stored in the stock room	5.00	Highly Implemented
E-waste are forwarded to the supply office	2.40	Less Implemented
E-waste are piled at the laboratory room	5.00	Highly Implemented
E-waste are stored in any available spaces	1.65	Least Implemented
Average	3.01	Moderately Implemented

It shows that for handling method which e-waste are stored in the stock room and e-waste are piled at the laboratory room are highly implemented at the NORSU system. And it also shows that the different handling methods of e-waste at NORSU system are moderately implemented.

Table 3 shows e-waste management practices implemented by NORSU in terms of disposal.

It shows that the different disposal methods of e-waste at NORSU system are least implemented.

Table 3: E-Waste Management Practices Implemented by NORSU in Terms of Disposal

Disposal	Mean	Verbal Description
Selling/Bidding	1.00	Least implemented

Hiring a private hauler to bring e-waste to specified location	1.00	Least Implemented
Land filled	1.00	Least Implemented
Donate	1.90	Less Implemented
Condemnation or destruction like burning, shredding, breaking and throwing	1.00	Least Implemented
Barter *(an agency transfer of property to another government agency in exchange of another property)*	1.00	Least Implemented
Transfer of property (property recommended for disposal may be transferred to another government agency)	1.00	Least Implemented
Average	1.13	Least Implemented

Table 4 shows e-waste management practices implemented by NORSU in terms of 3Rs (Reduce, Reuse and Recycle).

Table 4: E-Waste Management Practices Implemented by NORSU in Terms of 3Rs (Reuse, Recycle and Reduce)

Management	Mean	Verbal Description
Reusing of e-waste	2.50	Less Implemented
Recycling of e-waste	1.50	Less implemented
Reducing of e-waste	3.30	Moderately Implemented
Average	2.43	Less Implemented

It shows that for e-waste management practices in terms of 3Rs, reducing of e-waste has the highest mean of 3.75 with a verbal description of implemented. This is followed by reusing of e-waste with a mean of 3.12 and followed by recycling of e-waste with a mean of 3, both have a verbal description of moderately implemented. It also shows that in NORSU system, the implementation of 3Rs is less implemented.

Table 5: Summary for E-waste Management Practices Implemented by NORSU

E-waste Management Practices Implemented by NORSU	Average Mean	Verbal Description
Collection	2.50	Less Implemented
Handling	3.01	Moderately Implemented
Disposal	1.49	Least Implemented
Management in terms of 3R's	2.43	Less Implemented
Overall Average Mean	2.36	Moderately Implemented

Table 5 shows the summary for e-waste management practices implemented by NORSU as to collection, handling, disposal and management in terms of 3R's.

It shows that the NORSU system moderately implemented the different e-waste management practices.

Table 6 shows issues and concerns faced by the respondents on e-waste management at the NORSU system.

Table 6: Issues and Concerns Faced by the Respondents on E-Waste Management at NORSU System

Issues and Concerns	Weighted Mean	Verbal Description
There is no e-waste management system at NORSU.	3.50	Fairly Agree
E-wastes are being stockpiled in a room.	5.00	Strongly Agree
E-wastes are temporarily land filled due to lack of storage room.	2.70	Fairly Agree
E-wastes are piled in the corner of a laboratory room.	4.00	Agree
Lack of cooperation from faculty and staff	1.20	Least Agree
Lack of information drive about proper e-waste disposal.	3.60	Agree
Lack of guidelines on proper e-waste disposal.	4.60	Strongly Agree
There are no existing guidelines on proper e-waste disposal.	4.10	Agree
There are guidelines on proper e-waste disposal but no implementation.	1.50	Least Agree
Lack of information dissemination on proper e-waste management.	3.60	Agree
There is enough information dissemination on proper e-waste management but no strict implementation.	1.45	Least Agree
There is no committee on e-waste management.	5.00	Strongly Agree
Average	3.41	Agree

It shows that for issues and concerns faced by respondents on e-waste management at NORSU system, the highest mean of 5 with a verbal description of strongly agree is on issues and concerns that there is no committee on e-waste management and e-waste are being stockpiled in a room. This is followed by issues and concerns that there are no existing guidelines on proper e-waste disposal and lack of guidelines on proper e-waste disposal with a mean of 4.8 and 4.6 respectively, still with a verbal description of strongly agree. The lowest mean is on issues and concerns that there are guidelines on proper e-waste disposal but no implementation and that there is enough information dissemination on proper e-waste management but no strict implementation, which has a mean of 1.5 and 1.45 respectively, both with a verbal description of least agree.

DISCUSSIONS

Results show that faculties of NORSU are very responsible in managing e-waste assigned to them. In NORSU system, the e-waste collection method is not yet fully implemented since committee on e-waste management is not yet organized.

NORSU faculties were used to stocking and piling of e-waste in a stockroom or at the laboratory room by themselves. This practice assures them that when they retire the issued equipment listed in their names are all intact during the inventory.

At present, B2A enterprise is the contract hauler of NORSU Main I and II, while other campuses have their own contract hauler that will disposed solid waste to the specified location.

In NORSU system, recycling is less implemented since e-wastes were being stored in the stockroom for future inventory once an in-charge will be retiring or for whatever purposes.

Though the the NORSU system has not yet formulated the committee on e-waste management, but still the university moderately implemented the different management practices.

The management of the NORSU system has no guidelines on e-waste management since a committee on e-waste management has not yet been organized.

CONCLUSIONS

Based on the analysis of data, it was found out that there is no committee on e-waste managementthat deals with the impending influx of electronics and preparing for their proper disposal. Majority of e-wastes were being stockpiled in a room. Other hazardous e-wastes were being stockpiled on the grounds. Policy on e-waste management has not been created. There is poor awareness on the proper treatment of electronics waste to prevent harm to environment and the people. There is no established collection of e-waste to ensure that every piece of e-waste is collected and accounted for.

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