Study on E-waste Management and Monitoring in Samdrup Jongkhar Thromde

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ABSTRACT

Electronic waste has become a growing concern for every individual because of the increased use of IT-related equipment and devices. This research is coupled with Samdrup Jongkhar Thromde to find out how Samdrup Jongkhar Thromde is managing the e-waste. Moreover, this study will present the readers with the people's behavior in handling e-waste at the individual level and also the people's awareness of handling e-waste. Data was collected through distributions of questionnaires to the offices in the locality, Thromde Office, and people who resides in the Samdrup Jongkhar and Dewathang community. The study found out that increase in production of technologies, high obsolesces devices, and lack of cooperation and awareness among people has caused serious impacts that have resulted in poor waste management in Samdrup Jongkhar Thromde.

Keywords: e-waste, solid waste, waste management, waste monitoring

I.   INTRODUCTION

Background

E-waste is referred to the waste which is generated from the discarded electronic product. Every electronic product is composed of various metals, minerals, and chemicals, used for various functions. When these products get expired or damaged or discarded for an upgrade, these products are usually dumped like any usual waste but in these wastes, the chemical and minerals composition seeps into the environment in the landfill and contaminates the environment, water, and air which ultimately causes harm to human health and environment. E-waste is also called hazardous waste since the composition of those wastes do not undergo biological decomposition and gradually results in pollutant which is dangerous to human health.

In the current situation, we know the cell phone in our hand or the PC on our desk is harmful to us but we can't bear its absence too. We need all these electronic products in our day-to-day life. Electronic products are mainly disposed of for up-gradation to experience new features, some are disposed of as they are damaged or after their life expectancy. But now, the method of disposing and handling is a word of concern currently. People usually dump them in landfills along with other waste, and some even burn those waste along with other domestic waste. It creates air pollution and eventually leads to health hazards.

Bhutan at the constant rate produces 2400Mt of e-waste per year (Dema, 2017) and in the next 10 years, if the assumption is made, there will be 24000Mt of e-waste available in the surrounding. In Bhutan e-waste is generated as a result of the donation of electronic products from other countries (Dahal, 2008). "This year, the DIT received 100 second-hand computers from Korea. The Pentium II and Pentium III computers were gifts from KADO and the computers were provided free of cost, the shipping cost was also borne by KADO." Bhutan is accepting second-hand computers from a developed country as a gift. Some believe it is beneficial in implanting IT knowledge to rural Bhutanese youth but maybe in a way those developed countries are dumping their waste.

The Samdrup Jongkhar is inhibited by 10,545 population, when these people use a cell phone each, there is 10,545 potential E-waste within this township in near future. Likewise, every household has a TV set, a refrigerator, and other electronic devices.

E-waste can lead to many health issues such as inflammation and oxidative stress – precursors to cardiovascular disease, DNA damage and possibly cancer, etc. According to a report published by IOP Publishing's journal *Environmental Research Letters on 31st May 2011,* it states that due to the crude recycling process, many pollutants, such as persistent organic pollutants and heavy metals, are released from e-waste, which can easily accumulate in the human body through the inhalation of contaminated air.

E-waste is not serious as of now in our society, but by looking at the problems faced by those developed countries, electronic product leads to a potential danger in near future, so one must take a proper measure to control this necessary evil which if not properly handled can cost us our health and environment.

A. Aims
The study aims to study how e-waste is managed and monitored in Samdrup Jongkhar Thromde by the relevant stakeholders and how people handle the e-waste.

B. Objectives
- To examine the process of e-waste management in Samdrup Jongkhar Thromde
- To identify the nature of e-waste generated
- To assess the level of awareness on e-waste management
- To assess the measures implemented in curbing issues related to e-waste.

C. Problem Statement
Proper E-waste management became a major need as it is increasing yearly due to growing numbers of electronic things imported for various purposes and it contains toxic substances that are harmful to health and its environment. Due to the increasing technology, the evolution of various electronic devices has made the growing concern of e-waste all across the globe. Now, with the increase in the population and exposure to the external world, the use of electronic gadgets by an individual has also increased. As people were having less knowledge about e-waste, they don't care much about it and without segregating the e-waste, they dump it along with other wastes. E-waste is an emerging problem that Samdrup Jongkhar Thromde and Bhutan as a whole may face in the future, if necessary, measures are not taken into consideration.

About 912 e-waste items were generated between 2016 – 2017 as per the baseline report on waste. To properly manage e-waste, the DITT under the Ministry of Information and Communications was supposed to outsource the handling of e-waste to a private entity starting in 2018. However, the ICT officer said the department is not able to recruit a private firm as of now due to a lack of expertise and knowledge in the field and a lack of financial resources. With this project, our area of study focused on the people of Samdrup Jongkhar thromde by setting up questionnaires for the public, Thromde, and organization level in which we have surveyed how they are managing e-waste and what are the issues and challenges related to it.

D. Hypothesis
For this study, the area of study was identified as Samdrup Jongkhar Thromde which has a population of more than ten thousand and it is classified as Class A Thromdee in the country.

Following are some of the hypotheses from this study.

- People in the locality don't have good knowledge about e-waste management.
- People throw e-waste in dumping yards and landfills along with other domestic waste.
- Most people in Samdrup Jongkhar Thromde community doesn't recycle the e-waste
- The clean environment is getting damaged due to an increase in e-waste production and poor e-waste management.

II.   LITERATURE REVIEW

Proper e-waste management became a major concern as it is increasing yearly due to the growing numbers of electronic things imported for various purposes. Due to the expansion of technology, the evolution of new electronic devices has made the growing concern of e-waste all across the globe including Bhutan. According to Kuensel, the national newspaper, Bhutan has produced around 2400MT of E-Waste in 2016 alone, and over the period, it was expected to increase by double.

According to the report prepared by DITT, Ministry of Information and Communications, about 912 e-waste items were generated between 2016 – 2017 as per the baseline report on waste. To properly manage e-waste, it was supposed to outsource the handling of e-waste to a private entity starting in 2018. However, the department was not able to recruit a private firm as of now due to a lack of expertise and lack of financial resources.

Today, the waste generated from electrical and electronic products has become a global concern with a potential hazard to our existing world. Bhutan, a tiny developing country with a negative carbon index is also going to face a serious issue due to the growing numbers of electronic things imported for various purposes. Bhutan has produced around 2400MT of e-waste in 2016 alone [4]. The global data says this issue is growing exponentially and it is a

bigger concern. E-waste is an emerging issue, posing threat to public health and the environment, as toxic materials used to make electronics and their components are discarded every day in the country. According to the National environment commissions, e-waste, just like any other wastes, especially hazardous waste, could pose threat to public health and the environment. "It is because hundreds of different toxic materials are used to make electronics and their components. Some of these materials are mercury, lead, beryllium, cadmium, and brominated compounds and many others which are very toxic to human health as most of these are carcinogenic.

The study conducted by NIIT, India, in 2009 estimated that by 2014, there will be about 1,105 to 1,810 metric tons of e-waste in Bhutan. The National Environment Commission's (NEC) report on Bhutan's state of the environment, 2016 has pointed out that the country is seeing an increase in the amount of solid waste generated because of rapid socio-economic development, increasing population, and urbanization. More problematically, the composition of waste is shifting from biodegradable to non-biodegradable waste.

According to a Case Study conducted at the College of Science and Technology, Bhutan, e-waste in Bhutan has become a major problem owing to no appropriate disposal in place. The increasing mobile phone usage and the trend of changing mobile phones within a few years contribute to generating e-waste. We are not an exception to this global concern, and we cannot simply sit and put blames others for this rising issue.

III. METHODOLOGY

A. Gathering information

To carry out this study, we have referred at different universities and institution who has carried out similar studies on the e-waste manage or e-waste monitoring systems in their community. We have also carried out an extensive literature review on the topic so that it has helped us to develop and areas of our studies and accordingly, we have defined the aims and objectives of the study.

The study was conducted with regards to electronic gadgets such as mobile phones, computers, and common household appliances, considered as a single component of e-waste to examine the process of e-waste management in Samdrup Jongkhar Thromde. With our project, we want to check the awareness of e-waste management among Samdrup Jongkhar Thromde citizens and to identify different e-waste management processes and different reasons responsible for the production of e-waste.

When people were asked about e-waste 16.3% of the participant are unaware of what e-waste is and 50% of the survey participant thinks that the lack of awareness program on e-waste is the main drawback of lacking information on e-waste.

B. Setting up the questionnaires.

The research questionnaires were framed as per the aims and objectives we have defined in the studies. In the process of study, we have identified three groups of stakeholders, and accordingly, we have framed the questions; general public residing in Samdrup Jongkhar Thromde, Organizations and offices who produced e-waste, and lastly Samdrup Jongkhar Thromde offices in monitoring the e-waste. The question was framed to get the people's views on e-waste management, monitoring, and people's behavior in handling the e-waste at the individual level.

The DITT official said the private entity will have to handle e-waste in an environment-friendly manner. Once the private entity takes over the responsibility of handling e-waste, people will no longer have to worry about how to dispose of them. She said to address the issue of e-waste and its management, creating an efficient and sustainable system and hiring experienced personnel in the field of waste management is required. "The department lacks technical knowledge and practical experiences since the technical competency of our staffs are not relevant and complementing," she added.

C. Data Collection

The research was carried out in the Samdrup Jongkhar Thromde area, the people were randomly selected for the questionnaires and the Thromde administration and institutions within the reach were asked, as they are in a better position to give us suggestions and comments in the process. The questions to offices and institutions were mailed to the concerned person and their responses were fruitful in our research.

The study on e-waste is theoretical that is mainly on the quantitative approach. We have gathered the information for the primary success such as literature reviews of works carried out by the individuals. In this study, we have

distributed three categories of questionaries to the public, organization, and thromde office online as well as in hard copy. We have sent at least 250 copies of questionnaires to which 170 respondents responded.

D. Data Analysis

The data analysis was carried out on the 170-respondent responses to the survey questionnaires. Google form was used as the tool to collect the data from the people and that has helped in analyzing the data. Regarding the survey, questionnaires were distributed in hard copies, we have used MS Excel to analyze the data.

IV.   RESULT

A. Findings

From the data analysis we have carried out, we found that 83.7% of the people residing in our locality has the knowledge about the e-waste, though there are some peoples who do not exactly know it is called e-waste at least they know that it is a waste that will have an impact on the environment if they throw it like other waste. Therefore, 97.7% responded that these wastes are harmful to the environment and eventually can cause harm to human health and only 15.7% of respondents never knew that e-waste has an impact on living beings.

The study also found that 69.8% of respondents repair their non-functioning devices and use them again and when the devices are no longer repairable, they throw them as waste. There was an increase in e-waste over the years as stated by most of the respondents and almost every home has at least four electronic devices that will go into the e-waste after their life cycle.

The graph below presents the readers with what normal people do when they replace old electronic devices with new and higher versions of electronic devices.
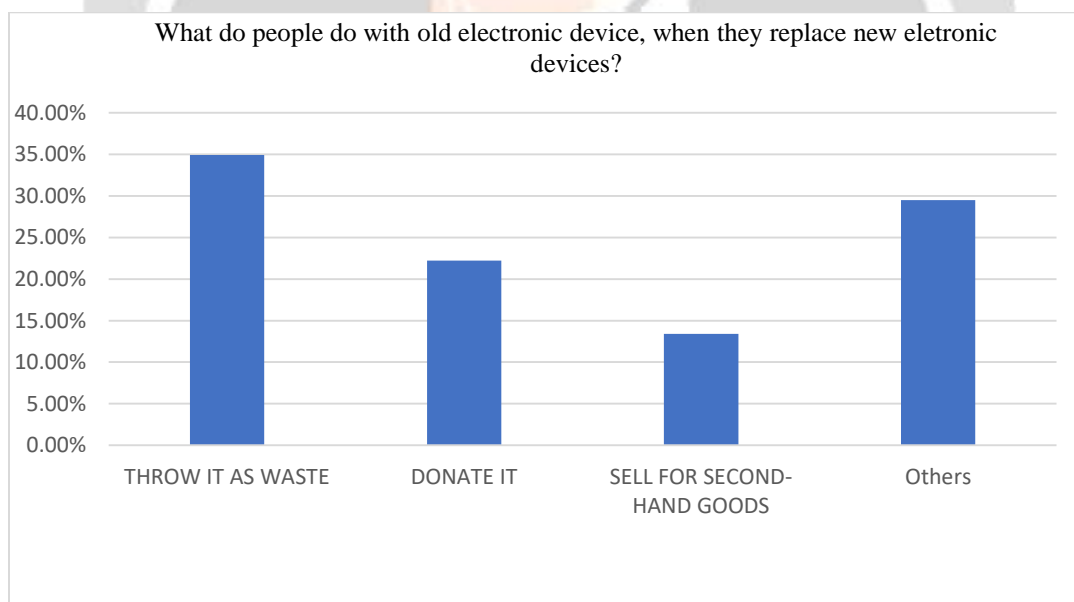

Figure 1: People's options when they are replaced with new electronics devices.

From the above graph, about 35% of respondents responded that they throw old electronic devices as waste when they replace with new devices at their home and about 29% of respondents said that they give it to family and friends, keep it as memory and they leave it ideal at their home and also, they throw along with other waste as presented in the graph above that has developed a concern organization who looks after the waste such as Thromde office and Samdrup Jongkhar Initiative Office.

The study found that only 41.9% of respondents segregate the e-waste from other waste and maximum of them throw it along with other waste or leave it unattended that has been a challenging job for Thromde officials who are working on environmental conservation and waste management in the locality. At the same time, 30.2% of respondents were found to be taking safety measures while handling e-waste, and about 69.8%, did not use any safety measures such as using hand gloves, waste collection machines, and chemical-resistant disposal gloves that may be due to a lack of awareness and knowledge on the impact of e-waste if it is not handled properly. From the

finding, we came to know that only 39.5% of the people know about the recycling Centre and agencies who handle such waste but which is not there in our locality for recycling.

When it comes to the people's behaviors on use of old electronic devices that would reduce the procurement of new electronic devices was mainly because of the lack of spare parts to repair and also it is cheap to replace with new ones then repair cost as given in the graph below.

What is the main factor that affects repairing non-functioning electronic devices?
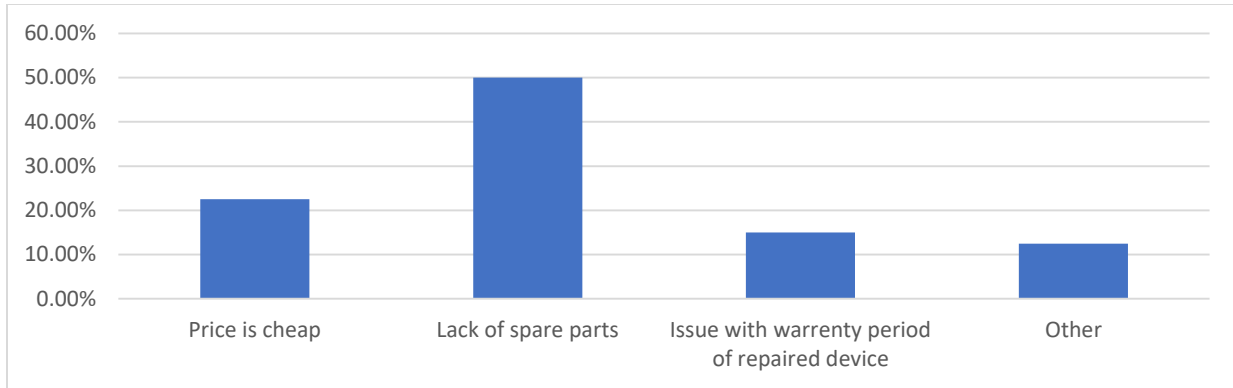

Figure 2: Factors affecting from repairing the non-functioning electronic devices

According to the survey respondents, every individual uses a cellphone and those devices go to waste after their life cycle or when they upgrade with new phones. Although 90.0% of respondents responded that they normally use the cell phone until no longer can be used then it was a known fact that every house has at least four to five cellphone users and also 37% of respondents said this is the most produced e-waste in their community from their opinion beside Television and Refrigerators.
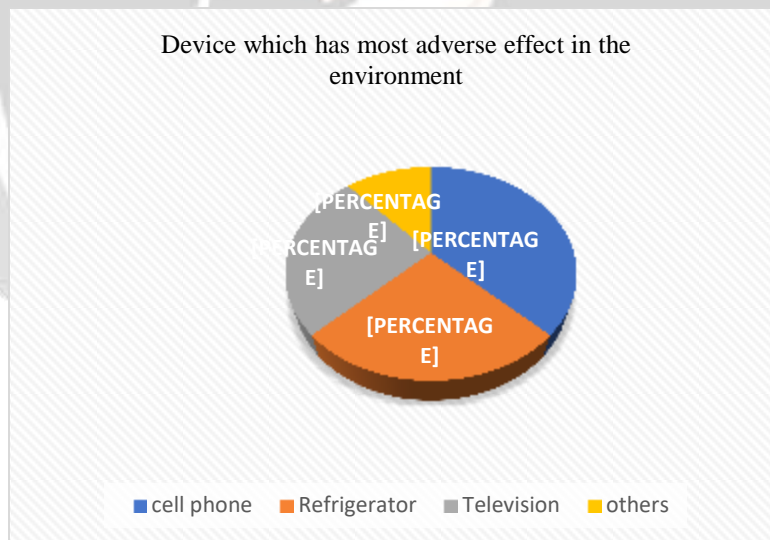

Figure 2: Devices which has an adverse effect in the environment

Regarding the Thromde Administration in managing and monitoring the e-waste, they have a waste collection in the municipal areas three times a week but it has been observed a challenging for them because of a lack of people's cooperation in waste management and waste segregation. The study also found that they do not have waste segregation bins placed in the municipal areas but they do waste segregation at the time of waste collection which is not a healthy practice.

As stated, above the lack of people's cooperation in handling e-waste makes the process harder. Thromde has identified a separate area within the landfill just for e-waste and also has provided awareness to people by

conducting an awareness program 3 times as of now, but to date, not a single call is received by thromde about disposing of e-waste. So, the planned process of thromde has not yet been implemented.

The study also found that Thromde has collaborated with DITT in 2017, whereby DITT has promised to take e-waste from thromde, but so far, no waste has been collected.

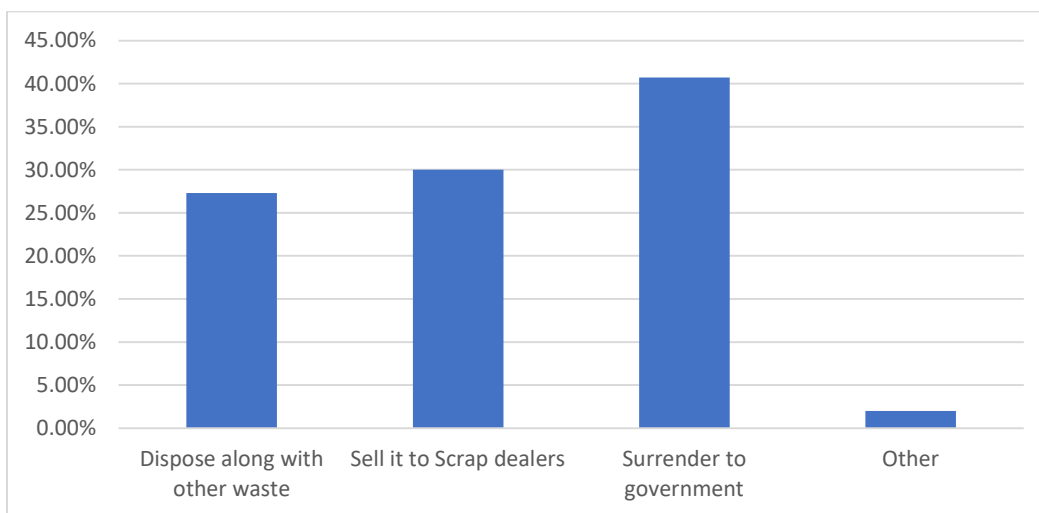The graph below shows how the organization handles e-waste.

Figure 3: the practices used by the organization to handle e-waste

While discussing the e-waste management by the organizations, office in the Samdrup Jongkhar Thromde community, 15 organizations responded to the survey questionnaires from which 15 organizations used to surrender the obsolete electronic devices to the government. This study also found that all organizations do not have a policy on what to do with used, unused components and other electronic devices except the thromde office and Samdrup Jongkhar thromde office.

In the finding, most produced e-waste in the organization were computers and printers and as per the suggestions shared by the organization, it is good for the government to come up with the hardware resources in the community to handle the repairing works would reduce the e-waste in the community.

V.   CONCLUSION

Solid waste management in Bhutan is becoming more complicated with the addition of e-waste particularly computer and phones. Institutional infrastructure, including e-waste collection, transportation, treatment, storage, recovery, and disposal needs to be established, at the National level or Dzongkhag level for the environmentally sound management of e-waste. People can play a major role in solving the e-waste problem through the adoption of proper disposal of electronic gadgets.

The objective of this research is to examine people's awareness of e-waste and its management process. All the collected data on e-waste is analyzed to find the current e-waste management in Samdrup Jongkhar Thromde. Through this research, we found out that 83% of them know about what e-waste is but they don't follow the appropriate procedure in managing e-waste due to a lack of knowledge on how to manage e-waste and people lack cooperation among themselves and thromde have no proper system of e-waste management as of now.

Currently, Electronic waste has not been a major problem in Samdrup Jongkhar thromde but if people living in that area continue to be ignorant about the disposal of electronic waste, it will become a major problem in Samdrup Jongkhar Thromde soon. Therefore, if Thromde Administrator could set a proper management system for managing electronic waste or any policies regarding this and if an individual takes responsibility for their e-waste, it will help in reducing e-waste.

VI.   RECOMMENDATION AND FUTURE STUDIES

The similar kind of studies can be taken up in the future to check the people's awareness on the e-waste management and status of the e-waste in the region over the period of time. From this study, we would like to

recommend that there should be people's cooperation in handling the e-waste and there should be series of knowledge awareness program so that people will know the impact of e-waste if it is not handled properly. Therefore, following are some of the recommendation for the better management of e-waste in the community.

a) Conduct awareness programs to find a better solution for creating awareness about e-waste to people and also advise them on how it handles it and where to dispose of it.

b) People should be made aware that thromde has identified some areas in a landfill for e-waste only and people should not dispose of the e-waste along with other wastes.

c) Thromde must make a separate collection Centre for e-waste.

d) The organization and offices should play a vital role in handling their own e-waste than disposing to the Thromde officials.

e) Further research needs to be carried out regarding the e-waste handling, disposal, and management of e-waste

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