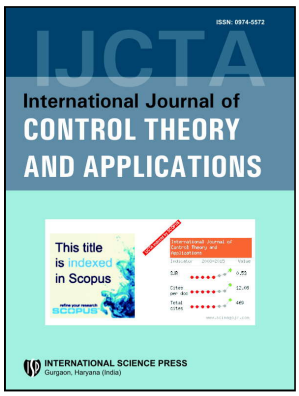

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e-Wastage: An Analysis of Barriers & Evolution in the Context of Nepal

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Abstract: After the emergence of 4G technologies, the electronic devices targeted to the end users have become a day to day essential parts. The traditional methodologies have changed, today the mode of communication, retrieving the information, and the way the end users are entertaining themselves have dramatically changed. This paper elaborates on today's fact that the demand of such electronics devices have been growing drastically and the production exponentially. As the demand is growing, and the production is exponentially growing, patterns of sales, storage, and disposal and collection for recycling management have also been changed. Waste managers, manufacturers, and policymakers need reliable and current information to inform and improve the management of used electronics. Electronic waste may not be such hazardous as the chemical waste but they may be hazardous in some stage of the recycle process. There are no such formal agencies formed in Nepal, which are working for the proper disposal of e-waste. Accumulation in the production of the e-waste may leads to an environmental disaster if measures are not taken to manage the waste in the proper manner. There are no such researches carried out in the field of e-waste management in Nepal. According to the UN report on e-Waste Monitoring published in 2014, Nepal is lacking the government policy to trace and handle the e-waste and related things.

The importance of e-waste management and its management practice is recently increasing in context of Nepal. In this research based on the identification of that different factors such as political and regulator factors, socio-economic factors, technical and institutional factors and waste production and disposal.

It can be concluded that lack of regulation dealing specifically with e-waste is the major problem to manage the e-waste. Without proper implementation of regulation, no individual or private agency can work efficiently for e-waste. In the context of Nepal, lack of budget is also the major barriers to carry out the activities related to e-waste management.

Keywords: e-Wastage; e-Wastage Management; barriers; policy;

1. INTRODUCTION: COMPONENTS & HAZARDOUS SUBSTANCES OF E-WASTE

1.1. Background of Study

There is a huge increase of e-waste generation in the surrounding environment in developing, under developed and developed countries. Advancement and rapid increase in the technology and the increased economic activity

leads to the increase in the production of the electrical and electronic waste. After 1990 the growth in electrical and electronic equipment production and consumption ratio has been increased exponentially. As the technology is changing rapidly, innovation in the technology take place day-by-day, hence the use of the technology is also rapidly changing in nature. All the discarded, obsoleted or broken electric or electronic devices are considered to be the e-waste. As per current estimates, e-waste is growing almost three times the rate of municipal solid waste globally (Status Report, Srilanka 2014 cited in Samarakoon, 2014). Both the white and brown goods are included in the e-waste. Refrigerators, washing machines and microwaves enabled devices are considered as white goods whereas television (TV), computers and radios are considered as brown goods. There is a constant replacement of the old goods by new one.

1.2. Problem Statement

1. What is the overall situation of E-Waste Management in the context of Nepal?
2. What are the causes of E-Waste generation in Nepal?
3. What could be the major barriers for E-Waste Management in Nepal?

1.3. Printed Circuit Boards

1.4. Mercury Containing Components

1. Batteries such as nickel-cadmium, lead-acid, lithium and mercury-containing button type
2. Lamps such as fluorescent, mercury vapor, metal halide and high pressure sodium
3. Thermostats containing a metallic mercury ampule
4. Pesticides meeting certain conditions for being unwanted, recalled, suspended or cancelled

1.5. LCD (Liquid Crystal Display)

1.6. Batteries

1.7. CRT (Cathode Ray Tube)

1.8. Health and environment hazard

1.9. e-waste Handling and Separation, Storage & Processing at the Source

1.10. Collection of the e-waste

Since the wastage of any means whether it is electronic devices or any other, they are surveyed in the above figure as purely poisonous, especially parts and musters containing proscribed substances. Thus as mentioned above, a special focus has to be given for the proper e – management, and subsequently handling the e-management. Most of the wastages are very very toxics in chemical wastages, however in considering e – wastage the wastages are not relevantly toxics. However, when they come under recycling or any other kind of treatment, they become toxic. For example, an old battery, which is lying unused is not so much poisonous in itself. However, when it is broken and burnt, for recycling it emits acids, furans and dioxins.

It is a very difficult task to predict the estimated quantity of waste flows most of the e-product have lives which last several years. Especially in developing nations where the technological infrastructure is still lagging, it has become a difficult task to accomplish about the approximate estimation of e-waste flow. Disposal: There can be several stages in between when the product can either be reused, or simply stored in basements and attics.

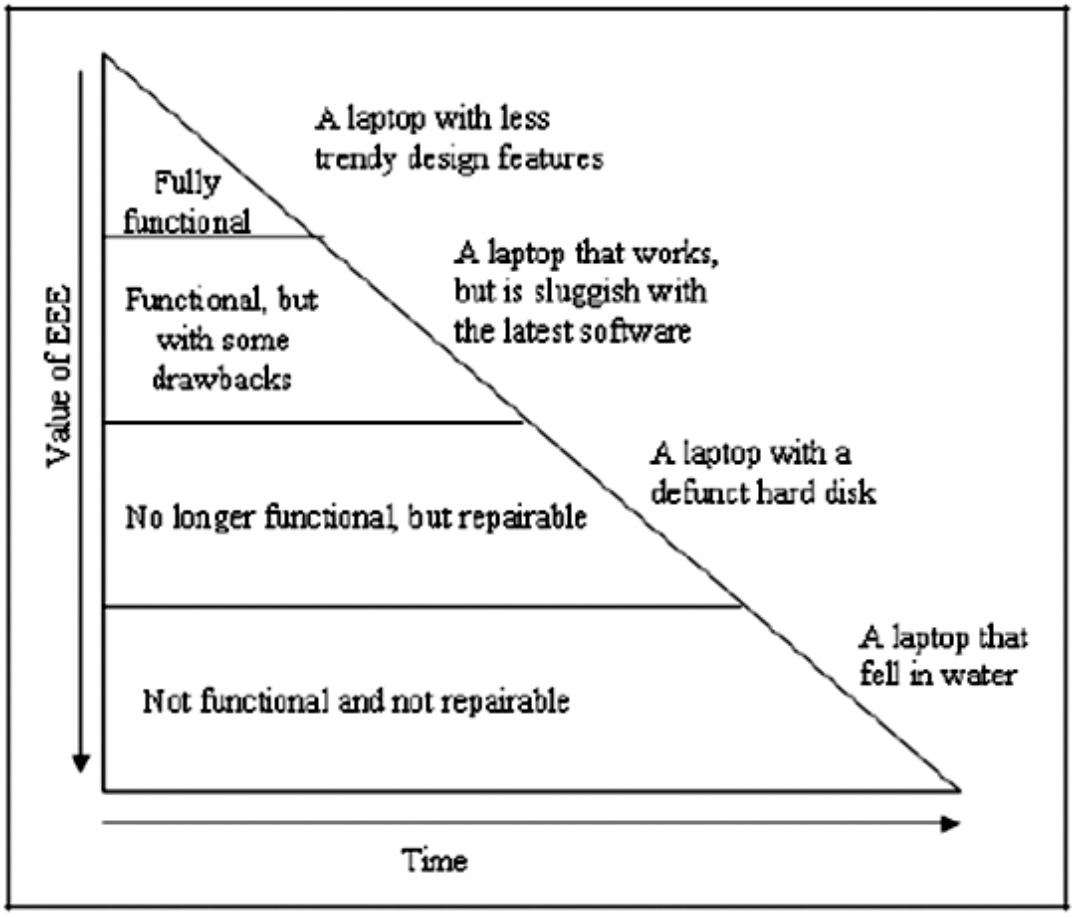

Figure 1: Stages of EEE

What is being done to manage e-waste?

As all are aware, the technology has been in cutting edge where every day or the other, we find updated tools, software, devices, and other essential electronic sensor tools, and the rapid production and use of these has yielding out directly proportional to the rate of e-waste generation and subsequently, the task of managing the e-waste has become more difficult and challenging. All over the globe, many governmental or non-governmental communities have started realizing the seriousness, importance and the urgency to adopt frameworks to regulate monitor and control of the disposal of e-waste.

2. THEORETICAL FRAMEWORK

Based on review of recent relevant literature on E-waste management schematic image showing the theoretic framework has been developed.

From the figure right, it is clear that there are some of the unorganized sectors seem to be active in Nepal. Due to the lack of proper policy, the Government of Nepal is not in a position to give the proper regulatory actions to be taken in care of these wastages. Hence, a lot of aviated opinions and solutions about the informal sector regarding e-waste management are been published or spoken about. Even it is very disappointing to note that there is no authentic source available on how many organizations and how much e-waste is actually recycled in Nepal by both the formal and informal sector, it is difficult to estimate the real economic benefits.

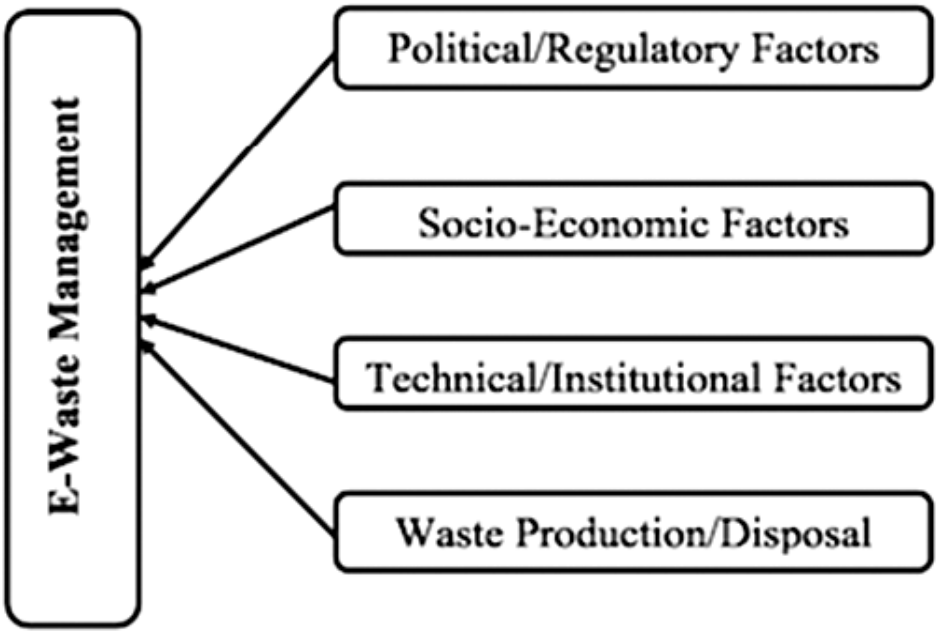

Figure 2: Theoretical framework of E-Waste management

Descriptive Analysis of Research Variables: Descriptive analysis of this research paper includes the basic explanation of central tendency, particularly mean and variation of variables of the study. These variables are further divided into 24 measurable questions while collecting responses. In addition, the descriptive central tendency and variation of the 4-subscale is calculated in order to find out E-Waste Management in Nepal. Thus, this section consists of descriptive analysis performed to analyze measurable questions as well as study variables.

2.1. Political/Regulator Factors

The effect of Political and Regulator Factors on E-Waste Management has been analyzed based on 4 different questionnaires. Out of these four items PRF1 denotes, Government initiation is highly present in E-Waste Management in Nepal. PRF2 denotes, there is proper policy for E-Waste Management in Nepal. PRF3 denotes Nepal has full support of foreign country in E-Waste management in Nepal and finally PRF4 represents, Nepal is following the international practices to handle the E-Waste.

It can be concluded that respondents' feels there must be proper policy for E-Waste Management in Nepal. Proper policy helps to manage the e-waste in effective ways that is generating every year.

2.2. Social-Economic Factors

The effect of Socio-Economic Factors on E-Waste Management has been analyzed based on 4 different questionnaires. Out of these four items SEF1 denotes, E-Waste is environmentally hazardous. SEF2 denotes Electronics parts may be profitably recycled. SEF3 denotes everyone should be ready to pay for e-waste collection and finally SEF4 represents, a promotional activity is necessary for E-Waste Management. Figure 4: Socio-Economic Factors

It can be concluded that respondents' feels that promotional activity is very necessary for E-Waste Management in Nepal. Many of the people are not aware about how to manage the e-waste. We can found many small groups of people who are working for the E-waste Management, but people are unknown about such kind of efforts and activities. So, promotional activity is necessary to make it successful.

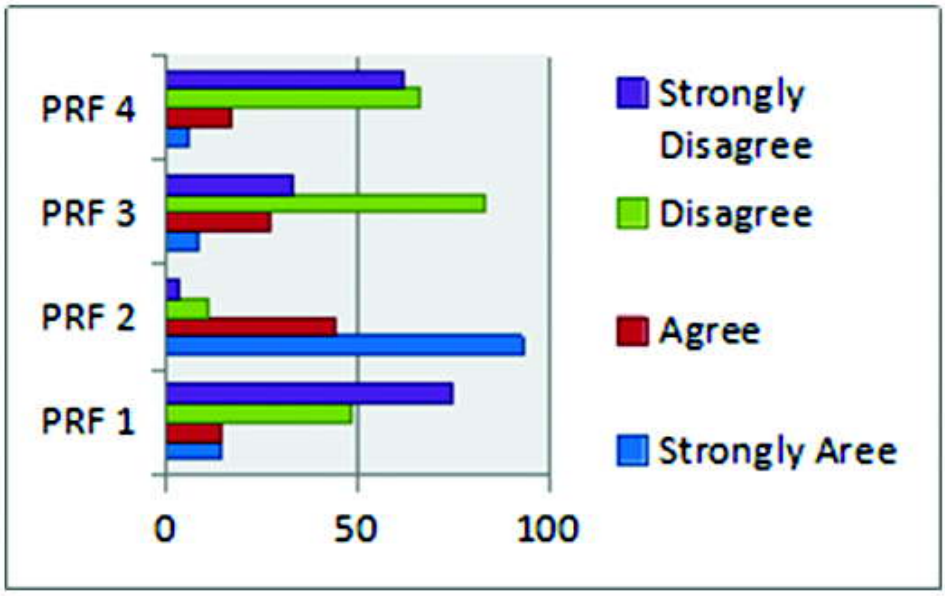

Figure 3: Political/Regulator Factors

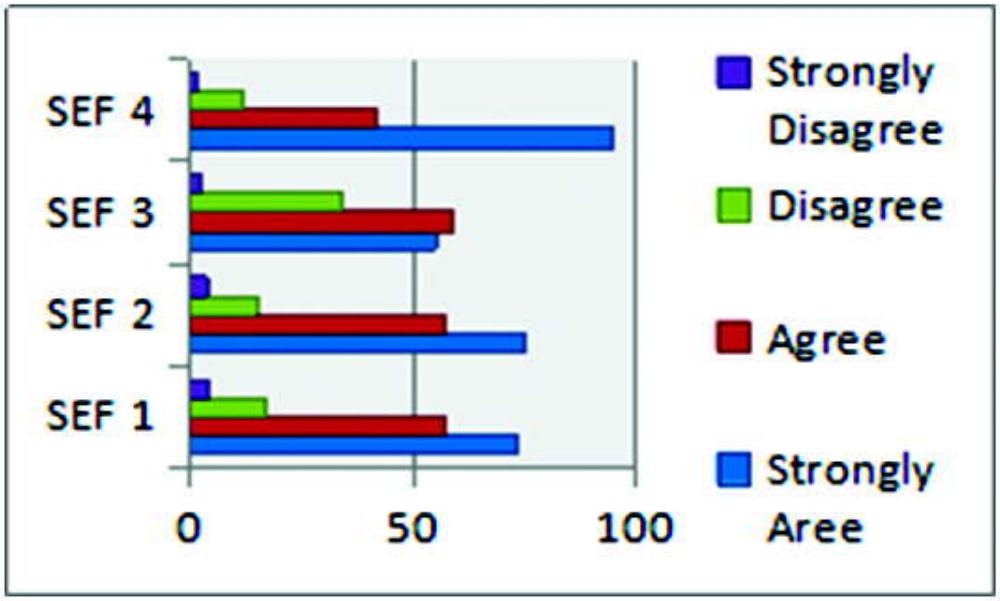

Figure 4: Social-Economic Factors

2.3. Technical/Institutional Factors

The effect of Technical and Institutional Factors on E-Waste Management has been analyzed based on 4 different questionnaires. Out of these four items TIF1 denotes, there is proper technology for E-Waste

Management in Nepal. TIF2 denotes every organization needs a procedure of handling E-Waste. TIF3 denotes training facilities is easily available to re-use and re-cycle the E-Waste and finally TIF4 represents, there is a separate government agency to manage E-Waste in Nepal. It can be concluded that respondents' feels that every organization needs a procedure for handling the E-Waste in Nepal. If every organization makes the procedure to handle e-waste in their own way, the generation of e-waste could be minimized and there will not be problem for the country to handle the large volume of e-waste.

2.4. Waste Production/Disposal

The effect of waste Production and Disposal on E-Waste Management has been analyzed based on 4 different questionnaires. Out of these four items WPD1 denotes, volume of E-Waste generation is increasing day by day. WPD2 denotes Discarded E-equipment must be sold or donate to other. WPD3 denotes Discarded E-equipment must throw away with other waste and finally WPD4 represents, hazardous parts in E-Waste need special method for safety disposal. It can be concluded that respondents' feels that volume of E- Waste generation is increasing day by day so, there is a need of special method for its disposal. Due to the advanced technology, every year many electronics items are being produced and side by side every year electronics items are getting damaged and e-waste are produced. In Nepal there is no advanced technology to manage this e-waste only items are generated but damaged items are not disposed properly. So, respondents feel that volume of E-Waste generation is increasing day by day so, there is a need of special method for its disposal.

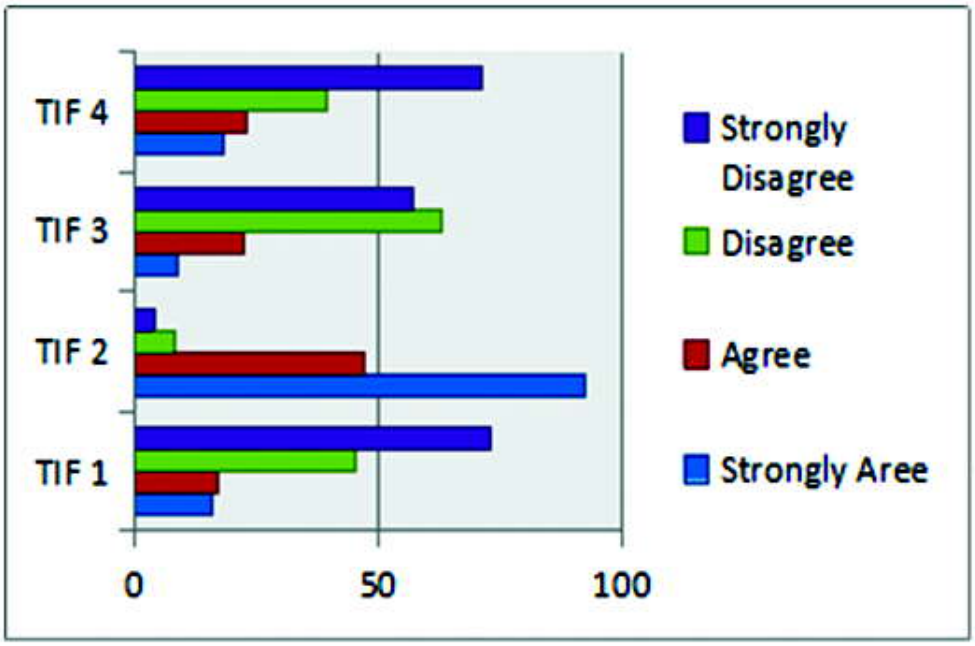

Figure 5: Technical/Institutional Factors

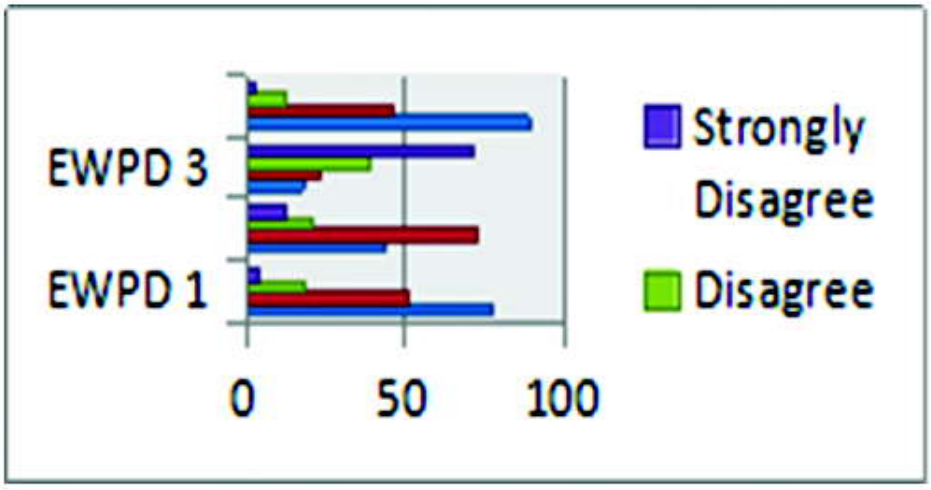

Figure 6: E-Waste Production and Disposal

2.5. E-Waste Management

The E-Waste Management has been analyzed based on 4 different questionnaires. Out of these four items EWM1 denotes, I am aware about E-Waste and its management. EWM2 denotes there is need of E-Waste collector in each area. EWM3 denotes the current method of E-Waste collection is convenient and finally EWM4 represents,

Information about E-Waste Management is easily accessible in Nepal.

It can be concluded that respondents' feels that there is a need of E-Waste collector in each area for the E-Waste Management in Nepal. If there is available of e-waste collector in each area, it could bring very easy to collect the e-waste for the disposal and every people will also not get confuse what to do with the e-waste simply they will go and put the e-waste in collecting area.

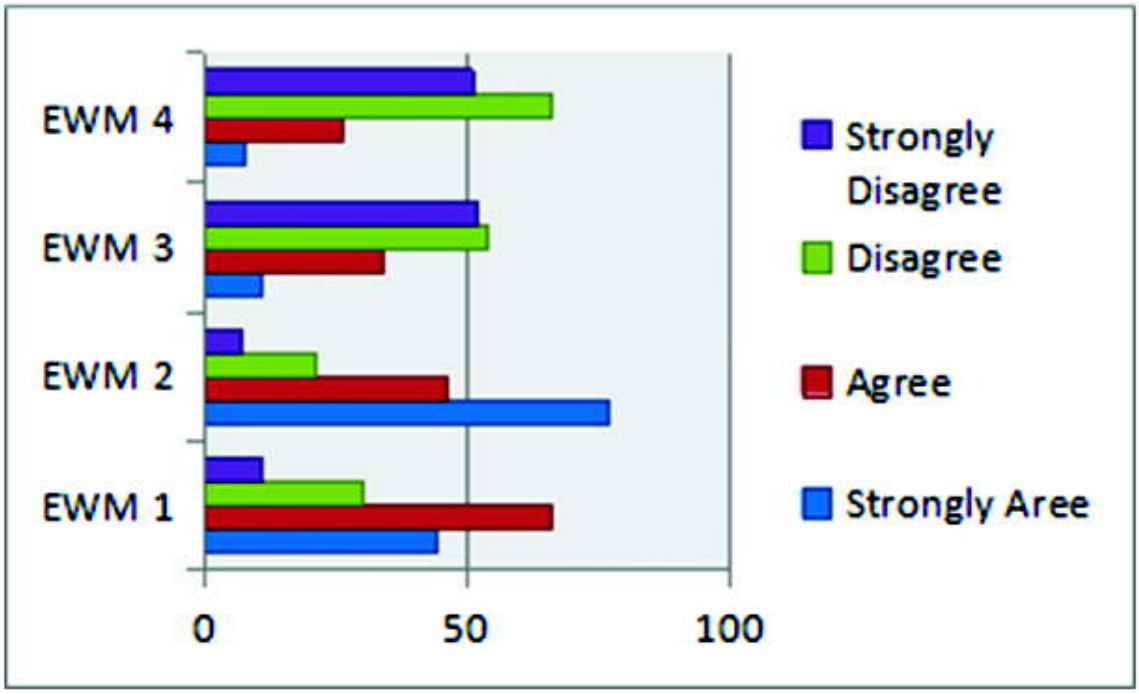

Figure 7: E-Waste Management

3. FINDINGS

This study has been conducted in order to find the factors responsible for E-Waste Management in Nepalese context. Based on the literature review, several factors affecting the E-Waste Management have been recognized. So, the researcher recognized some of the relevant variables such as Political and Regulators Factors, Socio-Economic Factors, Technical and Institutional Factors, and Waste Production and Disposal. There are no such researches carried out in the field of e-waste management in Nepal. According to the UN report on E-Waste Monitoring published in 2014, Nepal is lacking the government policy to trace and handle the e-waste and related things. During this survey, Civic Engagement Project was found initiated by the members of United States Embassy Youth Council (USYC) and supported by U.S Embassy and YUWA. It has been initiated with the view to manage electronic wastes from house hold and work-places so as to make them reusable and provide those reusable items to remote communities, women groups and the needy. The major objective of this study is to investigate the current situation and practices in e-waste management in Nepal. The main objective of this study is to identify the current situation of the e-waste management in Nepal, to find out the sources of E-waste Generation in Nepal, and to assess the barriers of E-waste Management in Nepal. The study is based on the

sample size of 151 where the responses were collected in physical form. To measure the reliability of this study, Cronbach's alpha will be used after the collection of data. This measures the internal consistency of the data to reflect the reliability. Among the total 151 respondents, few responses are collected from People who work in IT Company. Similarly few responses are collected from the people who work in electronic shops and some responses were collected from the manpower that is handling the e-waste management in Sankhamul area. Regarding the demographic profile, Out of total respondents of 151, there are 61 females and 90 males comprising the percentage of 40.4% and 59.6% respectively.

In addition to age, there are 37.7% of respondents who fall under the age group below 25 years, 56.3% respondents are aged 26-35 years, 2.6% respondents are of age group 36-45 years and 3.4% of respondents are of age group of 46 and 55 above year. Similarly, regarding the qualification, the respondents are categorized under four categories as SLC or below, Intermediate (+2), Bachelor and Master and above. 1.3% of the respondents are SLC or below respondents, 10.6% are Intermediate (+2), 51.0% completed Bachelor and 37.1% completed the Master and above. In continuation, out of 151 respondents, 33.1% of respondent are student, 53% of respondents are Service holders, 9.9% of respondent are self-employed (Business) and, 4 % of respondent are engaged in other professions.

This paper finally yields out with the brief overview of findings and conclusion of the study. From the findings, we have tried to make the generalization and hence propose some recommendations and suggestions for the further study. There are three sections in this chapter consisting summary of the findings in first section, conclusion of the study in second section and suggestions for further study in third section.

Major findings of the study are summarized as below:

- There is no proper policy for E-Waste Management in Nepal. Proper policy helps to manage the e-waste in effective ways that is generating every year.
- Many of the people are not aware about how to manage the e-waste. We can found many small groups of people who are working for the E-waste Management, but people are unknown about such kind of efforts and activities, which shows there is lack of awareness among government as well as public about e-waste management. So, promotional activity is necessary to make it successful.
- Every organization needs a procedure for handling the E-Waste in Nepal. If every organization makes the procedure to handle e-waste in their own way, the generation of e-waste could be minimized and there will not be problem for the country to handle the large volume of e-waste.
- The volume of E-Waste generation is increasing day by day so, there is a need of special method for its disposal. Due to the advanced technology, every year many electronics items are being produced and side by side every year electronics items are getting damaged and e-waste are produced. In Nepal there is no advanced technology to manage this e-waste only items are generated but damaged items are not disposed properly. So, respondents feel that volume of E-Waste generation is increasing day by day so, there is a need of special method for its disposal.
- There is a need of E-Waste collector in each area for the E-Waste Management in Nepal. If there is available of e-waste collector in each area, it could bring very easy to collect the e-waste for the disposal and every people will also not get confuse what to do with the e-waste simply they will go and put the e-waste in collecting area.
- Lack of infrastructure is the main barrier to Nepal for E-Waste Management. It is 100% true that Nepal is lacking the infrastructure to handle the e-waste in effective way. Many of the institutions are eager to work under e-waste management but due to the lack of infrastructures they are not being able to carry out their projects in proper way.

- Proper implementation of Technical and Institutional factors creates the positive impact on E-Waste Management. There is lack of human resources at both national and local level for EWM. Staff members have little or no technical background in EWM. Research and Development activities are low in EWM. If the emphasis were given priority in such factors there would be positive impact on e-waste management.
- The generation of e-waste and its proper disposal brings positive impact on E-Waste Management. Proper disposal method of e-waste helps to reduce the problems of e-waste in Nepal and also helps in managing the e-waste.
- The rapid advancement in ICT has result in improve capacity in computing devices but simultaneously decreases in the product lifetime as a result the generation of wasted electronic and electrical components is growing rapidly. As the generation of electronic waste is increasing day by day in large volume, by which there seems to be major problem in its management. As a result large volume of e-waste is generating due to outdated technology. This study aimed at finding the causes of e-waste generation and barriers of E-Waste Management in Nepalese context. In these researches, several factors affecting e-waste management were examined. Data for this study were collected using online questionnaire from different people of Kathmandu Valley. The study findings demonstrate that problem of e-waste management are experienced by everyone at their place. With regard to the objectives as mentioned for this research, following conclusions can be withdrawn. E-waste Management is a very critical and subjective issue. All the stakeholders have to be concerned before imposing rules and regulations. The law should not be imposed on a hit-and-trial basis. Before making any policies for the management of e-waste it would be wise to learn from the failure of banning plastics in Nepal. E-waste management is a new topic in Nepal. But it is the one that requires immediate attention. We do not have the means and resources for managing e-waste and it is sent to India. But what will our country do if India restricts the transnational movement of scraps of e-waste from Nepal.

n There is a problem of policy and budget in e-waste management due to lack of awareness in government and public about e-waste and its potential hazardousness. As a result, E-waste generation in Nepal are increasing due to outdated technology.The challenges facing the developing countries like Nepal in e- waste management include: lack of infrastructure for appropriate waste management, lack of legislation dealing specifically with e-waste and its management, lack of public awareness, lack of human resources, lack of organizational policy, Lack of political support.

In the context of Nepal, lack of budget is also the major barriers to carry out the activities related to e-waste management. Recycling and treatment facilities require a high initial investment, particularly those fitted with technologically advanced equipment and processes (Hicks et al. 2005). Lack of regulation dealing specifically with e-waste is the major problem to manage the e-waste. Without proper implementation of regulation, no individual or private agency can work efficiently for e-waste management. For the effective management of e-waste in Nepal it demands the establishment of effective product reuse through the re-manufacturing and using efficient recycling methods. For proper handling of e-waste, every organization needs a procedure to deal with e-waste management by which large generation of e-waste could be minimized and as a result there could be a better management of e-waste. Thus, E-Waste Management in Nepal is based on the ground idea of generating and executing a fugal plan about turning unwanted electronic wastes into productive and useful reusable goods, that can be of use to remote communities, which can create employment and training opportunities to some youth and which can also reduce such wastes and their hazardous effects to health.

4. CONCLUSION

The rapid advancement in ICT has result in improve capacity in computing devices but simultaneously decreases in the product lifetime as a result the generation of wasted electronic and electrical components is growing

rapidly. As the generation of electronic waste is increasing day by day in large volume, by which there seems to be major problem in its management. As a result large volume of e-waste is generating due to outdated technology. This study aimed at finding the causes of e-waste generation and barriers of E-Waste Management in Nepalese context. In these researches, several factors affecting e-waste management were examined. Data for this study were collected using online questionnaire from different people of Kathmandu Valley. The study findings demonstrate that problem of e-waste management are experienced by everyone at their place. With regard to the objectives as mentioned for this research, following conclusions can be withdrawn.

The next generation research domain in technology for sure will going to face a huge tectonics in E-waste Management as a very critical and subjective issue. They need to be focused informing the regulatory framework so that rules and regulations can be imposed systematically. Before making any policies for the management of e-waste it would be wise to learn from the failure of banning plastics in Nepal. E-waste management is a new topic in Nepal. But it is the one that requires immediate attention. We do not have the means and resources for managing e-waste and it is sent to India. But what will our country do if India restricts the transnational movement of scraps of e-waste from Nepal. There is a problem of policy and budget in e-waste management due to lack of awareness in government and public about e-waste and its potential hazardousness. As a result, E-waste generation in Nepal are increasing due to outdated technology.The challenges facing the developing countries like Nepal in e- waste management include: lack of infrastructure for appropriate waste management, lack of legislation dealing specifically with e-waste and its management, lack of public awareness, lack of human resources, lack of organizational policy, Lack of political support.

In the context of Nepal, lack of budget is also the major barriers to carry out the activities related to e-waste management. Recycling and treatment facilities require a high initial investment, particularly those fitted with technologically advanced equipment and processes (Hicks et al. 2005). Lack of regulation dealing specifically with e-waste is the major problem to manage the e-waste. Without proper implementation of regulation, no individual or private agency can work efficiently for e-waste management. For the effective management of e-waste in Nepal it demands the establishment of effective product reuse through the remanufacturing and using efficient recycling methods. For proper handling of e-waste, every organization needs a procedure to deal with e-waste management by which large generation of e-waste could be minimized and as a result there could be a better management of e-waste. Thus, E-Waste Management in Nepal is based on the ground idea of generating and executing a fugal plan about turning unwanted electronic wastes into productive and useful reusable goods, that can be of use to remote communities, which can create employment and training opportunities to some youth and which can also reduce such wastes and their hazardous effects to health.

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