



## Electronic-waste and awareness towards its disposal: A study in Dibrugarh district of Assam.

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### Abstract

E-waste is a term used to cover all items of electrical and electronic equipment (EEE) and its parts that have been discarded by its owner as waste without the intent of re-use. The purpose of this research article is to study user's awareness towards the proper disposal and management of E-waste in Dibrugarh District. The study is based on primary data collected through a structured questionnaire and can be useful in future policy formulation for e-waste management and in spreading awareness among the people about e-waste. The findings show that the level of awareness about e-waste and its management of the majority of the respondents are low. Moreover, it is also found that as many as around 28 per cents of respondents were completely unaware of e-waste issues. As far as the post-consumption behaviour is concerned, only 1 per cent of the total respondents agreed that they took the unused products to the local recycling centre while around 25 per cent of the respondents threw the old unused products in trash or garbage. The study thus suggests proper public education and sensitization on the hazardous effects of retaining e-wastes as well as marking of some e-waste drop off or collection points across the city would enhance an effective and efficient collection of obsolete electronic products.

**Keywords:** Sustainable Development, Electrical and Electronic Equipment, Waste Electrical and Electronic Equipment

### 1. Introduction

E-waste also referred to as Waste Electrical and Electronic Equipment (WEEE), electronic-waste or e-scrap is a term used to cover all items of electrical and electronic equipment (EEE) and its parts that have been discarded by its owner as waste without the intent of re-use (The Global E-Waste Monitor, 2014, pp 12). According to the Global E-Waste Monitor (2014), E-waste covers six waste categories:

- Temperature exchange equipment, which includes refrigerators, freezers, air conditioners, heat pumps.
- Screens, monitors, which include televisions, monitors, laptops, notebooks, and tablets.
- Lamps, which includes fluorescent lamps, high-intensity discharge lamps, and LED lamps.
- Large equipment like washing machines, clothes dryers, dish-washing machines, electric stoves, large printing machines, copying equipment, and photovoltaic panels.

- Small equipment, like calculators, radio sets, video cameras, vacuum cleaners, microwaves, ventilation equipment, toasters, electric kettles, electric shavers, scales, electrical and electronic toys, small electrical and electronic tools, small medical devices, small monitoring and control instruments.
- Small IT and telecommunication equipment, like mobile phones, Global Positioning Systems (GPS), pocket calculators, routers, personal computers, printers, telephones.

The global quantity of e-waste generated in 2016 was around 44.7 million metric tonnes (Mt) and it is expected to grow to 52.2 million Mt in 2021 with an annual growth rate of 3 to 4% (The Global E-Waste Monitor, 2017, pp 38). In India, 1975 kt (Kiloton) of domestic E-waste was generated in 2016 compared to 1641 kt in 2014. According to a joint study by ASSOCHAM-KPMG, India has emerged as the world's fifth-largest producer of e-waste, discarding

roughly 18.5 Lakh metric tonnes of electronic waste each year.

Rapid innovation and increased access to technology have led to an increase in the use of Electrical and Electronic Equipment (EEE). While the consumption rate EEE is expanding exponentially, their useful lifespan is decreasing as a result of rapid changes in equipment features and capabilities (Kang and Schoenung, 2005). Additionally, there has been a growing 'throwaway society', characterized by consumers who throw away and buy something new rather than keep and repair. This has resulted in the rapid growth of discarded electronics, thereby leading an expansion of WEEE. The growing demand for EEE has increased their consumption thus making e-waste one of the fastest-growing waste streams.

Although E-waste may represent only 2% of solid waste streams, yet it represents around 70% of the hazardous waste that ends up in landfill (A New Circular Vision for Electronics Time for a Global Reboot, 2019). Moreover, the sad part is a very small proportion of the total e-waste gets recycled. According to the Global E-Waste Monitor (2017), globally, only 8.9 Mt of e-waste are documented to be collected and recycled, which corresponds to only 20% of all the total e-waste generated. In India, according to a study by ASSOCHAM-KPMG, a mere 2.5 per cent of India's total e-waste gets recycled.

Thus, after knowing the international and national scenario, it is very clear that improper collection and treatment approaches of older EEE products plus newly discarding products can cause environmental damage and impact human health adversely. Although several initiatives have been taken worldwide to curbing this problem, it is important to aware users about the same. The limited awareness regarding the disposal of electronic equipment after its end-of-life may have a serious impact on society. One way of tackling the problem is by knowing it thoroughly, educating users about their ignorance attitude towards electronic garbage and by taking proper steps to reduce its ill-effects. Awareness of the users is most important in promoting the "reuse, recycle and repair" of EEE. It is thus crucial to undertake a study on the user's awareness towards the proper disposal and management of e-waste, especially in Dibrugarh district which is emerging as an economic hub of North East Region of India.

E-waste contains different substances, many of which are toxic, and creates serious environmental pollution and may human health if not disposed of

carefully. The environmental issues associated with e-waste arise from the low collection rates because of the final owner either stores the equipment in drawers, cabinets, cellars, attics etc. or disposes of those off through the normal household bins, finally ending up in burning or land fillings. Another dimension is where the waste ends up in undesirable channels and destinations, such as substandard treatment in developing countries. A better understanding and management of e-waste is closely linked to sustainable development goals. However, there is a dearth of studies on user's awareness towards the proper disposal and management of e-waste in Dibrugarh district. The present study is a humble attempt to know more about the user's awareness of the proper disposal and management of e-waste and add to the existing pool of knowledge.

## 2. Objectives of the study

1. To assess the awareness level of the users regarding e-waste and its management.
2. To study post-consumption behaviour for electronics.

## 3. Materials and methods

This is an exploratory research study to understand the user's awareness of e-waste in Dibrugarh. For conducting this research, primary data was used. The primary survey was done using a structured questionnaire. A total of 300 respondents from Dibrugarh were surveyed through a personal interview as well as through online mode to conduct the study. The collected data was coded and entered for statistical analysis using appropriate software.

User's Awareness Index (UAI) was calculated using Principal Component Analysis (PCA). For these seven questions on user's awareness with dichotomous responses were used. Based on the PCA results only one factor with (Kaiser Rule) Eigen value greater than one was extracted from the data (total variance explained 62.2 per cent). The factor scores that were obtained from the extracted factor was taken as the index score (Filmer and Pritchett, 2001). The factor scores were further categorized into three groups namely High, Medium and Low by using the 'ntiles' option of ranking data.

## 4. Results and discussion

### 4.1. Descriptive statistics

Table 1 presents the descriptive statistics of the variables under study.

**Table 1:** Descriptive Statistics

<b>Variables</b>	<b>Number of observations</b>	<b>Percentages</b>
<b>Age of the Respondents</b>		
15-25	85	28.33
26-40	132	44.00
40-59	58	19.33
60+	25	08.33
<b>Sex</b>		
Male	173	57.67
female	127	42.33
<b>Marital Status</b>		
Married	108	36.00
Divorced /Widowed	03	01.00
Unmarried	189	63.00
<b>Type of family</b>		
Joint	24	08.00
Nuclear	276	92.00
<b>Nature of Accommodation</b>		
Own	214	71.33
Rented	86	28.67
<b>Respondent's Education</b>		
Below HSLC	25	08.33
HSLC	79	26.33
H.S	46	15.33
Diploma / Graduate and above	142	47.33
Professional Degree and others	08	02.67
<b>Respondent's Employment</b>		
Government Employee	66	22.00
Business / Self employed	136	45.33
Private employee	62	20.67
Private Professional	10	03.33
Unemployed	26	8.67
<b>Household Monthly Income</b>		
Less than 10,000	44	14.67
10,000-24,000	187	62.33
25,000-39,000	48	16.00
40,000 and above	21	07.00

As shown in Table 1, a majority of respondents are in the age-group 26-40 years (44 per cent), followed by 15-25 years (28 per cent), 40-59 years (19 per cent) and 60+ years (8 per cent). Out of the sample

population around 58 per cent are males while around 42 per cent are females. According to marital status the sample is divided into three categories, consisting of married (consisting of 36 per cent), divorces /

widowed (1 per cent) and unmarried (63 per cent) respondents. As far as the type of family is concerned, a majority of the respondents belonged to the nuclear family while only around 8 per cent belonged to the joint family. Further, the majority (around 71 per cent) of the respondents live in own house while around 29 per cent live in a rented house. Around 47 per cent of the respondents have Diploma / Graduate and above degree followed by H.S.L.C (around 26 per cent), H.S (around 15 per cent), below H.S.L.C (around 8 per cent) and Professional Degree and others (around 3 per cent). The employment of the respondents in the sample is divided into five categories, namely, Government Employee, Business/Self-employed, Private employee, Private Professional and Unemployed. The majority that is around 45 per cent

belong to the Business / Self-employed category followed by Government Employee (22 per cent), Private employee (around 21 per cent), unemployed (around 9 per cent) and Private Professional (around 3 per cent). Approximately 62 per cent of the respondents belong to the 10,000-24,000 income group. The second major income group is the 25,000- 39,000 income category with 16 per cent of the respondents followed by less than 10,000 with 14.67 per cent of and 40,000 and above income category with 7 per cent of the respondents.

**4.2. Awareness level of the users regarding e-waste and its management**

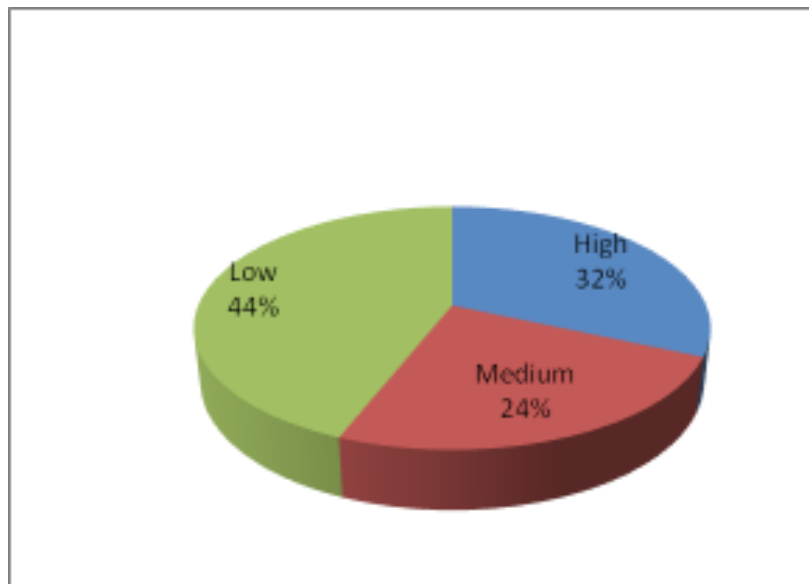
Table 2 presents the awareness level of the respondents regarding e-waste and its management based on the User’s Awareness Index (UAI).

**Table 2:** Awareness Level of the Users Regarding E-Waste

Categories	Number	Percentage
High	95	31.67
Medium	73	24.33
Low	132	44

As seen in Table 2, out of 300 respondents only 31.67 per cent were highly aware of e-waste and its management while around 24 per cent had medium awareness. A majority of 44 per cent had low

awareness about e-waste and its management as they scored ‘low’ in the User’s Awareness Index (UAI). This is shown in Fig. 1.



**Fig. 1:** Awareness level of the users regarding e-waste and its management

Table 3 presents the self-appraisal of the respondents regarding their awareness of the significance of e-waste and its management.

**Table 3:** Self-Appraisal about the significance of e-waste and its management

Categories	Number	Percentage
Completely unaware of e-waste issues	83	27.67
Have heard of e-waste but is unaware of the related issues	47	15.67
Somewhat aware of e-waste issues	20	06.67
Aware of e-waste issues but did not realize the level of importance	93	31.00
Completely aware of the issues and the level of importance	57	19.00

As shown in Table 3, when the respondents were asked to rate themselves on their awareness of the significance e-waste and its management, 31 per cent of the respondents agreed that they were aware of e-waste issues but did not realize the level of importance, followed by around 28 per cent respondents who were completely unaware of e-waste issues. Only 19 per cent of the total respondents agreed that they were completely

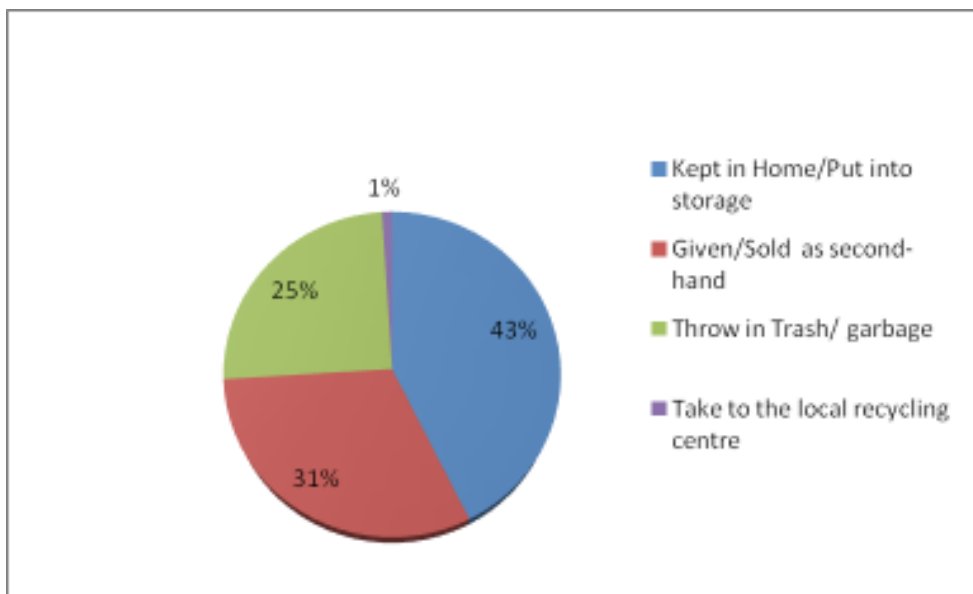
aware of e-waste issues. Further, around 16 per cent of the respondents have heard of e-waste but were unaware of the related issues while around 7 per cent reported being somewhat aware of the issue.

**4.3. Post-consumption behaviour for electronics**

Table 4 and Fig. 2 represents the disposal statistics of the electronic/electrical products that the respondents no longer use.

**Table 4:** Disposal of the electronic/electrical products

Categories	Number	Percentage
Kept in Home/Put into storage	128	42.67
Given/Sold as second-hand	94	31.33
Throw in Trash/ garbage	75	25.00
Take to the local recycling centre	03	01.00



**Fig. 2:** Disposal of the electronic/electrical products number

As shown in Table 4, when the respondents were asked about what they do with the electronic/electrical products they no longer use, around 43 per cent of the respondents responded that they have kept them at home or put them into storage, followed by around 31 per cent who said that they have given or sold those products as second-hand. Only 1 per cent of the total respondents agreed that they took the unused products to the local recycling centre while 25 per cent of the respondents threw the old unused products in trash or garbage.

## 5. Conclusion

E-waste has become a serious issue worldwide. Although several initiatives have been taken worldwide to curbing this problem, it is important to aware consumers about the same. Without consumer's awareness and participation, the specified goals of

sustainable development cannot be achieved. From this paper analysis it is clear that the level of awareness about e-waste and its management of the majority of the respondents are low. Moreover, it is also found that as many as around 28 per cent respondents were completely unaware of e-waste issues. As far as the post-consumption behaviour is concerned, only 1 per cent of the total respondents agreed that they took the unused products to the local recycling centre while around 25 per cent of the respondents threw the old unused products in trash or garbage. The study suggests that the government should be at the forefront of public education and sensitization on the hazardous effects of retaining e-wastes. It is also recommended that some strategic places or points should be marked as drop off points or collection points across the city as this would enhance effective and efficient collection of obsolete electronic products.

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