

A STUDY ON THE PERCEPTION OF THE HOUSEHOLDS ON E-WASTE MANAGEMENT IN MARTHANDAM

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ABSTRACT

Waste management, especially when it comes to electronic products, has been given much attention over the years in the country. E-Waste is otherwise known as electronic waste and includes old, broken or obsolete items such as computer monitors, keyboards, printers and projectors. E-waste took centre stage in the country's discourse on environmental conservation this World Environment Day. Still, the issue of e-waste, which is among the most dangerous kinds of waste, contains heavy metals and other toxic chemicals - remains insidious. Obsolete electronic devices are rapidly filling the landfills of the globe. In the US alone, more than 100 million computers are thrown away with less than 20% being recycled properly. The EPA estimates as much as 60 million metric tons enter landfills every year. Most electronics that are improperly thrown away contain some form of harmful materials such as beryllium, cadmium, mercury and lead. These materials might be trace elements, but when added up in volume, the threat to the environment is significant. Besides adding harmful elements to the environment, improper disposal of e-waste is a recycling opportunity lost. Almost all electronic waste contains some form of recyclable material, including plastic, glass and metals. Even today, when India is among the world's largest consumer of mobile phones with 1.5 million tonnes of e-waste generated in 2015, most consumers are still unaware of how to dispose of their e-waste. Most Indians end up selling their e-waste to the informal sector, which poses severe threats to human (including children's) lives, with its improper and highly hazardous methods of extracting the trace amounts of precious metal from it and handling e-waste for profit. Therefore there is a need for a study the perception of household e-waste and how it is disposed. This paper aims to study the households' knowledge and perception regarding the disposal of e-waste.

KEY WORDS: e-waste, perception, knowledge, methods, obsolete

INTRODUCTION

Electronic waste or e-waste is a term for electronic products that have become unwanted, non-working or obsolete which had essentially reached the end of their useful life. Because technology advances at such a high rate, many electronic devices become "trash" after a few short years of use. In fact, whole categories of old electronic items contribute to e-waste such as VCRs being replaced by DVD players, and DVD players are being replaced by blu-ray players. E-waste is created from any electronic materials like computers, TVs, monitors, mobile phones, PDAs, VCRs, CD players, fax machines, printers, etc.

It is growing at a very fast pace posing serious challenge in its safe management both nationally and globally. Unlike other kinds of waste, e-waste constitutes of disparate materials in which some of them are highly toxic and some of them are very precious. The Indian e-waste scenario is highly complex on account

of its dispersed generation and dumping from developed countries. The infrastructure and techniques employed in its recycling in India are very rudimentary, giving rise to human health and environmental concerns.

In India, electronic industry has witnessed rapid growth since economic liberalisation. This trend is supported by giant strides made by Indian IT sector. The latter has been one of the key drivers of economic growth fuelling higher levels of consumption. New products and services brought shift in the pattern of governance. It ushered in an era of infrastructure reform and e-governance. This shift was marked by the application of information technology in a big way in all areas. The government passed the first law on e-waste management in 2011, based on Extended Producer Responsibility (EPR) in an eco-friendly way. The rule has provisioned the target for the producers, which was missing in the first version of the Rule (2012). The Ministry of Electronics and Information Technology has initiated an E-waste Awareness programme under Digital India Initiatives, along with industry associations from 2015, to create awareness among the public about the hazards of e-waste recycling by the unorganised sector and to educate them about alternate methods of disposing their e-waste.

E-waste (Management) Rules 2016, enacted since October 1, 2017 had strengthened the existing rules. Over 21 products (Schedule-I) were included under the purview of the rule. This rule also extended its purview to components or consumables or parts or spares of Electrical and Electronic Equipment (EEE) along with their products. E-waste is growing at a Compound Annual Growth Rate (CAGR) of about 30% in the country. It estimated that e-waste generation was 1.8 million metric tonnes (MT) per annum in 2016 and would reach 5.2 million metric tonnes per annum by 2020. The present rule has strengthened the Extended Producer Responsibility (EPR) which is the global best practice to ensure the take-back of the end-of-life products.

The change in society's consumption patterns driven by large choices and rapid product obsolescence has created huge quantities of such end-of life or discarded products. This waste stream of used electronics is popularly known as electronic waste or e-waste. E-waste problem is of global concern due to the production and disposal of waste in a globalized world. The Electronics industry is the world's largest and fastest growing manufacturing industry. Recent policy changes in India have led to an influx of leading multinational companies to set up electronics manufacturing facilities and R&D centres for hardware and software.

WHY SHOULD E-WASTE BE RECYCLED?

E-Waste is the fastest growing source of waste in the present scenario. Land filling e-waste is harmful to the environment because of substances such as cadmium, lead and nickel which can leach into the soil and water course. Recycling or reprocessing such waste eliminates the need for the waste to fill the land.

STATEMENT OF THE PROBLEM

Electronic industry is the world's largest and fastest growing manufacturing industry. E-waste contains many hazardous components that may negatively impact the environment and adversely affect human health if not properly managed. E-waste constitutes multiple components some of which are toxic that can cause serious health and environmental issues if not handled properly. This paper attempts to study the perception of households on e-waste management in Marthandam.

REVIEW OF LITERATURE

Ajeet Saoji in his article entitled, 'E- Waste Management: An Emerging Environmental and health issue in India', interprets that, the E-waste is going to become a great challenge for environmentalists and technologists as the rate of growth is much higher than the rate of disposed, rescued and recycled. There is an urgent need for improvement in e-waste management covering technological improvement, operational plan, implementing a protective protocol for the workers working in e-waste disposal and educating public about this emerging issue posing threat to the environment as well as public health.

G. Galdajis, K. Angelakoglon and D. Aktsogloou in their article entitled, 'E- Waste: Environmental problems and current management', interprets that, e-waste separation from the rest of solid waste and its recycling for the recovery of the valuable raw materials and basic metals is essential. The management system has to be rationally designed. So that the environmental benefits from the collection, transportation, management and financial benefits from the recovery are not set off by the required resources and energy consumptions for the system operation.

A. Merlin Thanga Joy K.S. Chandrasekar in their article entitled, 'perception of Households on E-waste Management in Tamilnadu' interprets that, in India, it is becoming more complicated by the invasion of e-waste, particularly cell phone waste and computer waste. There exists an urgent need for a detailed assessment of the current and future scenario including quantification, characteristics, existing disposal practices, environmental impacts etc. Model facilities employing environmentally sound technologies and methods for recycling and recovery are to be established.

Neethu Lukose in her article entitled, 'A Review on E-waste Management and Recycling Challenges in India' interprets that, problem of E-waste is growing tremendously not only in India but all over the world. Improper handling and management of e-waste during recycling and other end-of-life treatment options may develop potentially significant risks to both human health and environment. In India, consumers are expected to receive payment for E-waste, which is viewed as a potentially valuable resource. If management of E-waste is properly carried out, is an opportunity as it is often called as "urban mining".



TABLE 1 - E-WASTE SOURCES, CONSTITUENTS AND ITS EFFECTS ON HEALTH

| E-WASTE SOURCES | CONSTITUENTS | HEALTH EFFECTS |
|--|------------------|--|
| Solder in printed circuit boards, Glass panels & gaskets in computer monitor | Lead | Damage to central and peripheral nervous systems, blood systems and kidney damage. Adverse effects on brain development of children; causes damaged to the circulatory system and kidney |
| Chip resistors and semi-conductors | Cadmium | Toxic irreversible effects on human health, accumulates in kidney and liver and causes neutral damage. |
| Relays, switches and printed circuit boards | Mercury | Chronic damage to the brain, disorders in respiratory and skin due to bio-accumulation in fishes |
| Galvanised steel plates and decorator or hardener for steel housing | Chromium | Causes bronchitis |
| Cabling and computer | Plastics and PVC | Burning produces dioxin that |

| | | |
|---|--------------------------------------|---|
| housing | | causes reproductive and developmental problems |
| Electronic equipment and circuit boards | Brominated flame-retardants | Disrupt endocrine system functions |
| Front panels of CRT | Barium, phosphorous and heavy metals | Causes muscle weakness and damage liver, heart and spleen |
| Copper wires, printed copper circuit board tracks | Copper | Stomach cramps, nausea, liver damage |
| Nickel-Cadium rechargeable batteries | Nickel | Allergy of the skin to nickel results in dermatitis, lung to nickel results in asthma |
| Lithium-ion battery | Lithium | Lithium can pass into breast milk and may harm a nursing baby, inhalation of the substance may cause lung enema |
| Motherboard | Beryllium | Carcinogenic (Lung Cancer), Inhalation of fumes and dust causes chronic beryllium. |

OBJECTIVES OF THE STUDY

1. To study the e-waste disposal methods followed by the households.
2. To examine the various condition of the electronic products at the time of replacement.
3. To know the period of usage of household electronic items.
4. To find out the correlation between educational qualification with disposal methods followed by households using chi square test.

METHODOLOGY

This study is based on a questionnaire survey that consists of quantitative approaches for data analyses. Descriptive research is used for the study. Convenient Random sampling is used for the selections of sample from the households.

DEMOGRAPHIC PROFILE OF THE RESPONDENTS

The following table shows the demographic profile of the respondents. Demographic profile of the sample respondents taken into consideration with the help of the variables like gender, age, marital status, occupation, education and gross monthly income.

TABLE 2 - DEMOGRAPHIC PROFILE OF THE RESPONDENTS

| DEMOGRAPHIC PROFILE | | | |
|----------------------|---------------------|-----------|------------|
| CLASSIFICATION | RESPONSES | FREQUENCY | PERCENTAGE |
| Gender | Male | 57 | 60 |
| | Female | 37 | 40 |
| Age | Less than 20 | 10 | 11 |
| | 20-40 | 45 | 48 |
| | 40-60 | 19 | 20 |
| | Above 60 | 20 | 21 |
| Marital status | Single | 42 | 45 |
| | Married | 52 | 55 |
| Occupation | Student | 15 | 16 |
| | Employed | 40 | 43 |
| | Unemployed | 9 | 09 |
| | Self employed | 30 | 32 |
| Education | Diploma/HSC | 9 | 10 |
| | Graduate level | 20 | 21 |
| | Post Graduate level | 26 | 28 |
| | Others | 39 | 41 |
| Gross Monthly Income | Below 10000 | 9 | 10 |
| | 10000-20000 | 11 | 12 |
| | 20000-30000 | 12 | 13 |
| | 30000-40000 | 17 | 18 |
| | 40000-50000 | 22 | 23 |
| | 50000 and above | 23 | 24 |

Source: Primary Data

From the above table, it is inferred that

- 60 % of the sample respondents are male and 40% of them are female.
- With regard to age group 48% belong to the age between 20 to 40 years age and 11% of the respondents are less than 20 years old.

- On the basis of marital status 55% of the sample respondents were married and 45% of them are unmarried.
- On the basis of occupation 43% of them are employed and 9% of them are unemployed.
- On the basis of education 41% of the sample respondents fall under other category and 10% of them are diploma/HSC level.
- With regard to gross monthly income 24% of the sample respondents have above Rs. 50000 and 23% of them earn Rs. 40,000 to Rs. 50,000.

TABLE 3 - YEARS OF USAGE OF THE ELECTRONIC PRODUCTS BY THE HOUSEHOLDS

The following table shows the duration of usage of the electronic products by the households.

| Classification | Less than 5 years | | 5-10 years | | 10-15 years | | 15-20 years | | Above 20 years | |
|---------------------|-------------------|------------|------------|------------|-------------|------------|-------------|------------|----------------|------------|
| | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage |
| Consumer equipments | 9 | 10 | 15 | 16 | 14 | 15 | 21 | 22 | 35 | 37 |
| Households: Large | 11 | 12 | 14 | 15 | 15 | 16 | 18 | 19 | 36 | 38 |
| Small | 13 | 14 | 17 | 18 | 17 | 18 | 17 | 18 | 30 | 32 |
| Telecommunication | 2 | 2 | 11 | 12 | 18 | 1 | 15 | 16 | 48 | 51 |
| Lightings | 5 | 5 | 7 | 8 | 9 | 10 | 19 | 20 | 54 | 57 |
| Others | 6 | 7 | 9 | 10 | 11 | 12 | 11 | 12 | 57 | 61 |

Source: Primary data

From the above table, it is inferred that majority of the respondents are using the electronic products for more than 20 years.

CONDITION OF THE ELECTRONIC PRODUCTS AT THE TIME OF REPLACEMENT OR DISPOSAL

A household intends to replace when the products get outdated, any frequent repairs happen and when its cost of repair is high. Some households replace to show their standard of living. An attempt is made here to know the condition of the electronic products at the time of replacement/disposal.

TABLE 4 - CONDITION OF THE ELECTRONIC PRODUCTS AT THE TIME OF REPLACEMENT

| Sl.NO | CONDITION | NO. OF HOUSEHOLDS | PERCENTAGE |
|-------|-----------|-------------------|------------|
| 1. | Working | 11 | 12 |

| | | | |
|----|---------------------|----|-----|
| 2. | Repairs but fixable | 26 | 27 |
| 3. | Repairing cost high | 57 | 61 |
| | Total | 94 | 100 |

Source: Primary data

From the above table it is clear that, 61% of the items are disposed when the repairing cost becomes high, 27% of the items are not fixable and 12% of the respondents dispose when the items are still working.

TABLE 5 - DISPOSAL METHODS FOLLOWED BY THE HOUSEHOLDS

The following table shows the various disposal methods followed by the households.

| S. No. | Methods | Consumer Equipments | Small Households | Telecomm unication | Lightings | Others | Total |
|--------|-----------------------|---------------------|------------------|--------------------|-----------|--------|-------|
| 1. | Second hand sales | 32 | 13 | 26 | 8 | 15 | 94 |
| 2. | Donated for charity | 29 | 17 | 23 | 11 | 14 | 94 |
| 3. | To friends/ relatives | 34 | 12 | 22 | 13 | 13 | 94 |
| 4. | Sold as scarp | 8 | 25 | 22 | 35 | 5 | 94 |
| 5. | Stored | 11 | 26 | 32 | 10 | 15 | 94 |
| 6. | Throw away | 15 | 26 | 8 | 13 | 32 | 94 |
| | Total | 129 | 119 | 133 | 90 | 94 | |

Source: Primary data

From the above table, it is observed that majority of the electronic items are disposed from telecommunication field by the sample respondents.

TABLE 6 - COMPARISON OF EDUCATIONAL QUALIFICATION WITH DISPOSAL METHODS FOLLOWED BY HOUSEHOLDS USING CHI SQUARE TEST

| S. No. | DISPOSAL METHODS | EDUCATIONAL QUALIFICATION | | | | TOTAL |
|--------|-------------------------|---------------------------|----------|---------------|--------|-------|
| | | Diploma/HSC | Graduate | Post graduate | Others | |
| 1. | Second hand sales | 1 | 2 | 1 | 0 | 4 |
| 2. | Donated for charity | 1 | 1 | 0 | 1 | 3 |
| 3. | To friends or relatives | 2 | 5 | 3 | 2 | 12 |
| 4. | Sold as scarp | 8 | 13 | 8 | 2 | 31 |
| 5. | Stored | 1 | 9 | 17 | 2 | 29 |
| 6. | Throw away | 2 | 6 | 4 | 3 | 15 |

| | | | | | |
|-------|----|----|----|----|----|
| Total | 15 | 36 | 33 | 10 | 94 |
|-------|----|----|----|----|----|

Source: Primary data

From the above table, it is found that the calculated value is higher than the table value. Therefore the null hypothesis, H_0 is rejected and the alternative hypothesis is accepted. It is proved that there is significant association between the educational qualification and the disposal methods followed by the households.

SUGGESTIONS

The following are some suggestions based on the present study.

- Need to address safe disposal of domestic waste.
- Impart training to generators on e-waste handling.
- Awareness program on recycling.
- Fix duties and responsibilities to recyclers.
- Tax incentives for scrap dealers.
- Reward and reprimand schemes for performance and non-compliance of e-

waste management

CONCLUSION

Electronics industry is the world's largest and fastest growing manufacturing industry. But, increase in sales of electronic equipments and their rapid obsolescence such as advancement in technology, change in fashion, style and status has resulted in generation of electronic waste which is popularly known as E-waste. E-waste contains many hazardous components that may negatively impact the environment and adversely affect human health if not properly managed. E-waste problem is of global concern due to the production and disposal of waste in globalized world. In India, e-waste management has greater significance not only due to the generation of its own e-waste but also because of the dumping of e-waste from developed countries. This is coupled with India's lack of appropriate infrastructure and procedures for its disposal and recycling. The challenge is to develop innovative and cost-effective solutions to decontaminate polluted environments due to e-waste to make them safe for human habitation, consumption and to protect the functioning of the ecosystems which support life. The hazardous nature of e-waste is one of the rapidly growing environmental problems of the world. The ever-increasing amount of e-waste associated with the lack of awareness and appropriate skill is deepening the problem. A large number of workers are involved in crude dismantling of these electronic items for their livelihood and their health is at risk; therefore there is an urgent need to plan a preventive strategy in relation to health hazards of e-waste handling among these workers in India. Required information should be provided to these workers regarding safe handling of e-waste and personal protection. For e-waste management, many technical solutions are available to be adopted in the management system, prerequisite conditions such as legislation, collection system, logistics, and manpower should be prepared.

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