

## A CASE STUDY OF ELECTRICAL AND ELECTRONICS WASTE MANAGEMENT PRACTICES PARTICULAR FOCUS ON JABALPUR

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**Abstract-** Whenever we think about waste, we thought only in terms of garbage waste and not anything else. Developed countries are arrangement with the problem of electrical and electronic waste management which is internally generated or are important from other countries. In India, Madhya Pradesh nation is main in E-waste era and Jabalpur town of Madhya Pradesh is the main town amongst all of the towns of India in E-waste era. A case study on electrical and electronic waste management was completed by conducting a survey in the city of India i.e. Jabalpur. Electrical and electronic equipment (or e-waste) have increasing attention from researchers around the world in recent years, with surveys into various aspects of e-waste management were examined. The respondents are to be classified into two categories which are computer, mobile and accessories seller, electrical and electronic goods seller, mechanic and scrap dealer. For data collection process interview technique was conducted. For the first three categories 10 respondents were selected and found result and concern idea between people about e-waste method and suggestions were received from these categories and also taken interviewed from few mechanics and scrapdealer. On the basis of this survey, it was suggested that part improvement should be minimize the informal method of e-waste management and motivations for the formal method and the awareness among the people about harmful effect of e-waste and for its proper disposal

**Keywords:** E-Waste, E-waste Management, Recycles, Sustainable e-waste management, WEEE.

### 1 INTRODUCTION

Electronic waste management is an appropriate disposal procedure for electrical and electronic equipment in a biologically friendly manner. E- waste management is an appropriate disposal procedure for electrical and electronic equipment in an environmentally friendly manner. With rapid industrial advances, the large number of electrical and electronic products has become outdated and their replacement has resulted in an increase in waste generation. The unfortunate management of these very toxic wastes may be a serious threat to the environment and its inhabitants. To overcome such problems, each country has arrangement a certain set of objectives, which are representative of the current and future needs of society or the nation and deploy its resources available to achieve these objectives. [1] In developed countries, electronic waste is handled by a more mechanized and systematic way, while, in developing

countries, such as India, the approach is more manual and laborious. [2]

#### 1.1 E-Waste Management

E-waste is basically used electronic and electrical appliance which either become outdated or reaches their end-of-life. E-waste or WEEE are lightly rejected, left-over, electrical or electronic devices Improper dismantlement and processing of e-waste extract it is extremely unsafe to our environment human health. Therefore, the need of proper e-waste management has been realized. In. In the last years, the rate of (WEEE) is growing at an alarming rate. The proper treatment and collection of WEEE requires a significant management system that includes various operators, as well as substantial logistical and technical resources. Since environmental concerns about WEEE first emerged, many researchers have investigated consumer attitudes toward recycling [4]

#### 1.2 E-Waste Toxicity to Human Beings

Strict and serious actions should be taken on e-waste since the toxic chemicals present in it are causing a big threat to human health and environment. Use of e-waste disposal methods like landfill and ignition are already affecting human health. Additionally, many natural resources get contaminated by this recycling phase causing toxic substances to enter the food chain and hence transmitting to humans [6],[7]

### 1.3 Current Situation of E-Waste Management

The global e-waste production is assessed at 20-50 Mt/year equal to 1-3% of the estimated global urban waste production (1636 Mt) [4, 2]. PCs, cell phones and TVs will contribute 5.5 Mt in 2010 and will amount to 9.8 Mt in 2015. In wealthier countries, e-waste will stand for 8% of the urban waste volume. Each electronic item's participation in the annual e-waste production, E (kg/year), depends on each electronic item's mass, M (kg), its quantity (number) in the market and consumption, N, and its average life cycle, L (year).

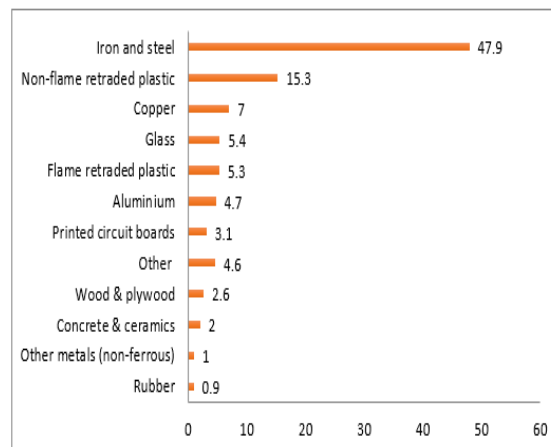
$$E = MN/L$$

**Table 1 E-Waste types and their predictable life cycle.**

ITEM	MASS OF ITEM (KG)	ESTIMATED LIFE (YEARS)
Personal Computer (Pc) <sup>A</sup>	25	3
Fax Machine	3	5
Hight-Fidelity System	10	10
Cell Phone	0.1	2
Electronic Games	3	5
Air-Conditioner	55	12
Electric Cooker	60	10
Microwave	15	7
Radio	2	10
Telephone	1	5
Refrigerator	35	10
Vacuum Cleaner	10	10
Washing Machine	65	8
Television (TV) <sup>D</sup>	30	5

According to Basel action network the e-waste is define as electrical and electronics waste includes a general and establish categories of their appliances started from large domestic purpose, such as refrigerators, air-conditioners, cell

phones, and consumable electronic items to computers throw out by their users, such as refrigerators, air-conditioners, cell phones, and consumable electronic items to computers throw out by their users [9].



**Figure 1 Composition [weight %]**

### 1.4 Management of WEEE

WEEE is mainly produced in country of the OECD, which have highly saturated markets for (EEE) which is estimated that globally, 20-50 million tons of WEEE is wasted annually with Asian countries disposing of 12 million tones. The amount of waste electrical and electronic equipment (WEEE) is growing at a painful rate, especially in organization for economic cooperation and development (OECD) countries where markets are saturated with huge quantities of new electronic goods.

**Table 2 Statistics of top five E- waste generating countries in 2019**

Rank	Country and rank in e-waste generation	EEE placed on the market (Kg/capita)	E-waste generation (kg/capita)	E-waste collection rate (percent)
1	China	13.3	7.2	16
2	Germany	18.2	19.4	52
3	Japan	21.3	20.4	22
4	India	5.8	2.4	1
5	USA	25.3	21	15

Amount of WEEE and the wide variety of materials they often contain (many potentially harmful to both humans and the environment) has focused on how WEEE is handled and can be prevented. The possible adverse health and ecological consequences of improper

treatment and action of WEEE (e.g., in China, India, USA, etc.) has further sensitive discussion in relation to the management of WEEE.[10]Source: CSE 2020

## 2. LITERATURE REVIEW

Zhang et al.2012: In this literature review author prescribed the waste equipment (WEEE) has carried out negative effects on the environment produced by the materials that constitute them. As a preliminary step, it is compulsory to make a judgment of the present condition of WEEE management, which is the objective of this work. The descriptive analysis of the technical and monitoring aspects of the current management system was developed in the learning expanse, including generation rates and the investigation of waste flows. Among the main results, the study of waste flows includes five categories that is televisions with 61% of and 18% sound devices, personal computers have 17%; Mobile phones with 2%, as well as fixed telephones with 1%. In the area of study, there is a lack of sensitivity of the population in the absence of environmental education programs.

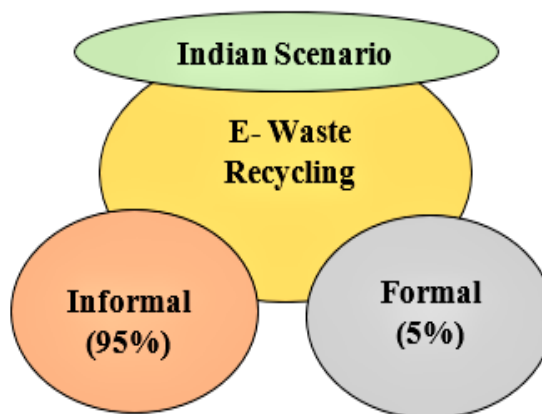
Shashi and Sunil (2020): In this research author is described the case is not the same with the developing countries due to several challenges and lack of relevant strategies and non-availability of treatment options are the major challenges affecting the entire E-waste rate in India.

Wang, W et al. 2017: In this research author described and systematically identify barriers for formal channels of household e-waste collection and considering different stakeholders such as the government, households, collectors, and treatment plants. Using perceptions from experts in e-wastes formal collecting enterprises. This paper develops three steps based on the method of grey-based Decision-Making Trial and Evaluation Laboratory (DEMATEL) to expose the most serious barriers in both the short and the long term by examining causal and effect relationships among these barriers. The results show that households' habits of selling e-wastes to peddlers is one key barrier.

### 2.1 Recyclers of E-Waste in India

FORMAL SECTOR-Carefully designed collection schemes have to be created to minimize losses and leakage of materials from the system. Aspects to be optimized for economic and environmental efficiency include collection infrastructure and frequency, energy/fuel usage during collection, convenience, communication and data-monitoring systems, health & safety, public participation and organization accuracy. Detailed overviews of the formal networks, systems, and compliance and take-back schemes used for the collection of e-waste from households can be found for various regions and countries (Williams, I.D. 2016).

**Informal Sector-** The informal sector has been the backbone of e-waste recycling in India, with various reports claiming that close to 90 per cent of the country's e-waste is being handled by the informal sector. Though this sector has managed to keep high volumes of e-waste from reaching dumping sites, while providing source of revenue to lots of people, the environmental and societal risks arising from non-scientific handling of e-waste have to be addressed. Operations in the informal sector can range from simple trading to material recovery and encompass everything in between like dismantling, repair, redecorating and open burning. (Ghanshyam Singh S. et al. 2020)



**Figure 2 E- Waste Recycling Status**

According to the Global E-waste Monitor, 2020, India generated 3.2 million metric tons (mMT) of e-waste in 2019. Year-wise e-waste generation in India,

provides an overview of e-waste generation in the country from the time the E-waste (Management) Rules were notified in 2016. Year-on-year growth in e-waste generation is approximately 13 per cent. (Ghanshyam Singh. S et al. 2020)

**Table 3 Year-wise e-waste generation in India**

Year	E-waste generation (million metric tonnes)
2015	1.97
2016	2.22
2017	2.53
2018	2.86
2019	3.23

(Source: CSE, 2020 compiled from The Global E-waste Statistics Partnership)

### 3. OBJECTIVE OF THE RESEARCH

Each research work proceeds with some motivation, and an objective of prerequisite. This work also progressed with the objective of reducing electrical and electronic waste, since this is well known that the waste of any process or product is that which does not add any value to it.

This significant objective in this work is as follows.

1. To identify the present method of e-waste management used by dealer/vender and showroom owner in the city of Madhya Pradesh i.e., Jabalpur.
2. To identify the present situation of e-waste in India which include status of e-waste, method of e-waste collection and legislation work done related to e-waste.
3. To conducted a survey in these two cities concerning e-waste management and to verify the research to received suggestion and recommendation given by the respondent.
4. To determine a improve model of e-waste management for Jabalpur city.

### 4. RESEARCH METHODOLOGY

The principle of a research is to quantify the amount of electronic waste generated in Jabalpur with the participation of the related local scrap vendors. Electrical and

electronic waste is comparatively a diverse addition to the increasing unsafe waste flow. Electrical and Electronic waste is the loss of electrical and electronic equipment, which is moderately a current addition of harmful waste, is bring together rapid care throughout the world as the volume created is increasing quickly. All electrical and electronic equipment (EEE), at the end of its useful life.

#### 4.1 Surveying Technique

In order to know outline of evolution and dumping of electrical and electronic waste, a survey must be needed to carry out in "Jabalpur city" state of Madhya Pradesh. The survey technique was performed in two steps given below:

- Collection of secondary data
- Primary data collection & analysis

#### 4.2 Sample Size According to Changed Market Location

- Computer & peripheral showroom proprietor/ retailer.
- Electronic and Electrical product showroom owner/retailer
- Some scrap dealer/ vendor of e-waste was also interviewed and findings are obtained.
- Mobile and accessories showroom owner/ retailer.

For the investigation we recognized a sample size of 10 suppliers from following commercial group according to firm size, owner of showroom, marketplace like vendors, retailer etc.

#### 4.3 Secondary Data:

In this phase, we identify the significance related to electrical and electronic communication product in Jabalpur city and evaluate by the measurement with percentage used household appliance, which are the main element to the generation of electronic waste. The percentage of household that possesses these articles in Jabalpur are shown below.

**Table 4 Percentage of Household Possessing Different Products**

District	Total Household	Total Percentage of Household having		
		Television	Computer:Lapto p	Mobile phone
Jabalpur	10,15,029	65.4	21.4	53.7

Source: Census of India 2011



#### 4.4 Primary Data:

The primary data was composed by organizing a survey, and in addition indicate the current situation of e-waste in **Jabalpur** city. After getting the result from receiver analyses was done. The survey technique starts through appreciation of different showroom owners/ retailers having some products knowledge. These all are classified into three categories and out of each categories have eight showroom owner/ retailer were selected and conduct an interview. The categories are given below as follows.

- Computer & Peripheral Seller
- Electrical & Electronic Goods Seller
- Mobile & Accessories Seller
- Scrap Dealer/Vendor Of E-Waste

#### 5. DATA COLLECTION, ANALYSIS AND RESULTS:

The survey conducted mainly has three points to be identified which are

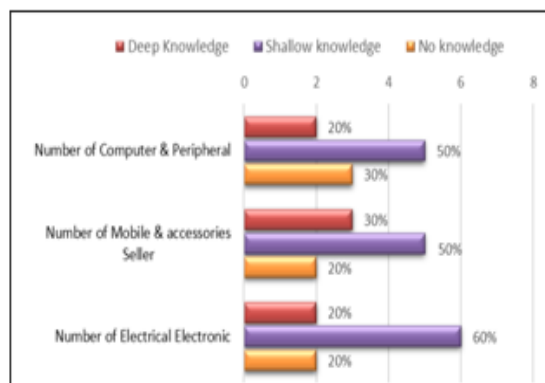
- Responsiveness about electrical and electronic waste and its organization among seller.
- Utilization of product received under replaced from consumer.
- Suggestion/recommendation about waste management.
- Result from scrap suppliers or retailers.

#### 5.1 Analysis of Data:

The data concerning about responsiveness from the different retailers questioning regarding dangerous effect about electrical and electronic waste and its organization. According to his answers we categorized three group retailers as having deep knowledge, shallow knowledge and no knowledge. The judgements are précised into tabular form and result was displayed in graph.

**Table 5 Understanding & Knowledge among Businesses on e-waste management**

Level of knowledge about-waste	Number of Computer & Peripheral	Number of Mobile & accessories Seller	Number of Electrical Electronic
Deep Knowledge	2	3	2
Shallow knowledge	5	5	6
No knowledge	3	2	2



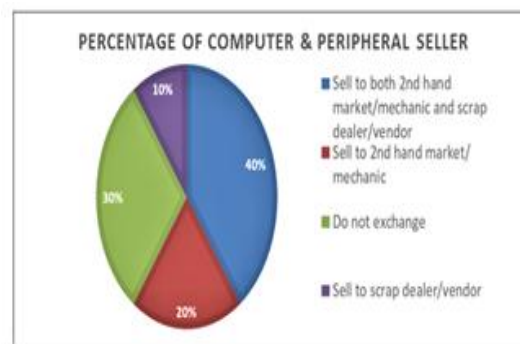
**Figure 3 Knowledge Level of Unique Supplier about E-Waste**

#### 5.2 Computer and Peripheral Sellers:

The discovery obtained from the computer seller and peripherals is summarized in the table and the result is presented in the graph.

**Table 6 Computer & peripheral showroom owner/retailer using different methods to manage e-waste**

S.No.	Code of showroom owner/retailer →	1	2	3	4	5	6	7	8	9	10
1	Sell to second hand market/mechanic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	Sell to scrap dealer/ vendor	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	Whether exchange facility available	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	Company supports for recycling	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓



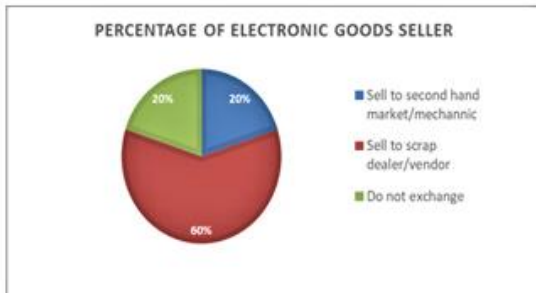
**Figure 4 Percentage of Computer & Peripheral Seller**

#### 5.2 Electrical & Electronic Goods Seller

The finding obtained from Electrical and Electronics supplier is summarized in table and result is shown in graph.

**Table 7 Electrical and Electronics seller**

S No.	Code of showroom owner/retailer →	1	2	3	4	5	6	7	8	9	10
1	Sell to second hand market /mechanic	√	x	√	x	x	x	x	x	x	x
2	Sell to scrap dealer/ vendor	x	x	x	√	x	√	√	√	√	√
3	Whether exchange facility available	x	x	x	x	x	x	x	x	x	x
4	Company supports for recycling	√	x	√	√	x	√	√	√	√	√



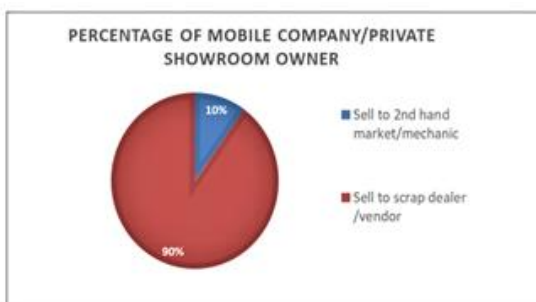
**Figure 5 Percentage of Electronic Goods Seller**

### 5.3 Cell Phone & Accessories Retailer

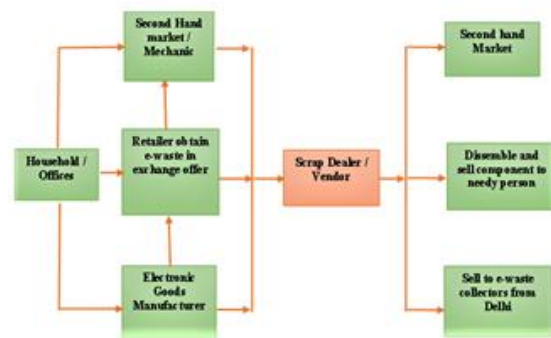
**Table 8 Mobile & Accessories Seller**

S No.	Code of showroom owner/retailer →	1	2	3	4	5	6	7	8	9	10
1	Wholesale to second hand market /mechanic	x	x	x	x	x	x	x	x	x	x
2	Sell to scrap merchant / vendor	√	√	√	√	√	√	√	√	√	√
3	Whether exchange facility available	x	√	√	√	√	x	√	√	√	√
4	Company supports for recycling	√	x	x	x	x	√	x	x	x	x

√-Yes, x - No



**Figure 6 Percentage of Mobile Company/Private Showroom Owner**



**Figure 7 Current scenario of Flow of E-waste in Jabalpur City**

## 6. CONCLUSION

Reports from all over the world show that this practice can cause the environment Pollution and public health problems in the medium and long term. The government Should make a plan to develop a prototype through which the informal recycler could also participate in electronic waste environmentally friendly recycling. The Government should only authorize these recyclers to participate in the auction for electronic waste that performs recycling in the environment manner. Additionally, the statistics found remained significant for further study in other research areas. Thus, the active participation and continuous research efforts of investigators from all over the world on the evaluation of e-waste generation is recommended.

Companies should also spread awareness for the peoples on the hazardous effect of e- waste and deliver suitable data on product elimination after use of product. The company should also encourage an improvement facility for proper disposal of electronic waste by the employer. For that collection drop center must be opened by the company for the customers. The establishment and source regarding e-waste should be made solid and accurately implemented so that human health and negative effect of e-waste could be restricted.

## 7. OUTCOME AND SUGGESTIONS

The outcome of this research lead to two important strategies that can serve as guidance for the e-waste. The first concerns the population's awareness of what e-waste is and how it should be disposed of. The second concerns the management of e-waste by the waste

pickers and cooperatives. Collecting, discarding and selling this e-waste can be a business opportunity for cooperatives if the recovery of materials is carried out efficiently and in an environmentally friendly manner. Proper instructions, and furthestmost significantly different technology is essential to be provided. A complete approach is desirable to address the challenges handled by India in e-waste management. The future opportunity of the investigate is to improve the variety of survey and such type of survey should be conducted in all the most important cities of countries and analysis to be performed to determine the method of e-waste management adopted in those cities.

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