

Study of e-waste management process in Rewa & Indore

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Abstract : The e-waste are different kind of electrical and electronic materials which have attained their useful life and are now discarded. As the purchasing power increases in a nation the consumption of electrical and electronic equipment, gadgets, phones increases exponentially. E-waste are hazardous and fatal for health as well as for Environment which makes its improper management a grave concern. In recent surveys it has been found that malpractices in breaking down non- working laptops, cell phones, and other goods in India; Which are generally burnt to dust has resulted in the residue from Electrical and Electronic Equipment (EEE) getting dumped in rivers, drains or disposed in Solid Waste dumps.

In this paper a study on situation and practices of e-waste management in two cities of India i.e. Indore and Rewa has been performed by conducting survey asking various questions regarding e-waste awareness, e-waste vs solid waste, management process, opinion and suggestion regarding e-waste management. Shocking results came as there is no proper understanding among people regarding environmental and health hazards associated with e-waste improper disposal. It was also found that there is no formal e-waste management practices are followed in most of the places. Based on this survey it was recommended that role of government in controlling informal handling of e-waste and to incentivize the formal sector for proper handling of e-waste. It is also recommended as Swachh Bharat Mission (SBM) is on and door to door collection of Solid Waste swinging in there should be another bin for e-waste and collected e-waste should be sent to CPCB authorized Re-cycler and Dismantler.

Keywords: CPCB, e-waste, EEE, SBM, Recycler, Dismantler, Organized and unorganized sector.

I. INTRODUCTION

As India is a third largest economy in terms of PPP (Purchasing Power Parity) and fifth largest in terms of nominal GDP with a sound growth rate of 7.5% India is fastest growing economy. India's population is second highest after China in the world. India is going to generate huge amount of EEE waste. Reasons behind staggering growth of e-waste may include: Growing speed of ICT (Information and Communication Technology) industries, Rapid technological advances, increasing number of users, increasing demand for superior innovation and efficiency, Social and Economic growth, shorter replacement cycle of EEE, Dumping of used and waste EEE into developing and underdeveloped countries by developed countries. EEE are manufactured and disposed worldwide. In 2016, 44.7 Million Metric Tons (MT) of e-waste was generated worldwide (equivalent to 6.1 kg per inhabitant). Following the current growth rate of rising e-waste, it is estimated that by 2021, e-waste will rise to 52.2 MT or 6.8 kg/inhabitant. In 2016, total e-waste generated in India was 2 MT; 79% of total e-waste was handled by unorganized sector and remaining 21% was handled by organized sector. The top three e-waste generator states are Maharashtra (19.8%), Tamilnadu (13%), Andhra Pradesh (12.5%). India is ranked 5th in the world among top e-waste producing countries. The large increase in the total e-waste generated in the world was mainly attributed to India said the report "An ASSOCHAM-KMPG study, Electronic Waste Management in India". Computer equipment account for around 70% of e-waste, followed by telecommunication equipment-phones (12%), electrical equipment (8%), medical equipment (7%) with remaining from household e-waste.

Categorization of e-waste: E-waste are categorized as stated below.

Table shows WEEE categories according to the EU directive on WEEE (EU, 2002a)

S. No.	Category	Label
1	Large household appliance	Large HH
2	Small household appliance	Small HH
3	IT and Telecommunications equipment	ICT
4	Consumer equipment	CE
5	Lighting equipment	Lighting
6	Electrical and electronic tools (with the exception of large-scale industrial tools).	E & E tools
7	Toys, leisure and sports equipment	Toys
8	Medical devices (with exception of all implanted and infected products)	Medical equipment
9	Monitoring and control instruments	M&C
10	Automatic dispenser	Dispenser

Among 10 stated categories first four (1-4) contributes almost 95% of total e-waste generated. These categories includes following products.

- Large HH- Washing Machines, Dryers, Refrigerators, Air-Conditioners, etc.
- Small HH - Vacuum cleaners, Coffee Machines, Irons, Toasters, etc.
- ICT- PCs, Laptops, Mobiles, Telephones, Fax Machines, Copiers, Printers, etc.

- CE- Televisions, VCR/CD/DVD players, Hi-Fi sets, Radios etc.
- LE- Fluorescent tubes, sodium lamps etc. (Except Bulbs, Halogen Bulbs).
- E & E tools- Drills, Electric saws, Sewing Machines, Lawn Mowers etc. (Except large stationary tools/machines).
- Toys, Leisure, Sports, and recreational equipment- Electric train sets, coin slot machines, treadmills etc.

LITERATURE REVIEW:

In 2015 paper Yamini Gupta and Sahay emphatically shows that to make Extended Producer Responsibility (EPR), 2016 one has to remove unorganized sector from e-waste management. Sukeshini Jadhav (2013) found that for efficient e-waste management manufacturing unit or producers has to play bigger role and there should some financial support to make e-waste management a lucrative business. In “Electrical and Electronics Manufacturing in India 2018 Report” the growth rate of e-waste generated state-wise in India has been shown beautifully. India’s contribution per capita in e-waste globally is also represented in this report. Shubham gupta (2014) tells in developing countries like India, China, Brazil, etc more focus is on economic aspect of e-waste instead of health and environmental treats involved with e-waste. Sikander and Vaniya (2014), to increase awareness regarding e-waste, suggest that there should be some topics related to e-waste in primary and secondary level schools. Hassan Taghipour (2012) bats for EPR, Rules strict implementation and to give more power to Environment Ministry as well as to Central Pollution Control Board (CPCB). United Nations Environment Program (UNEP) (2010) report estimates e-waste generation in India from old computers will be six times, from discarded phones 1700% higher, from Televisions 200% higher and from discarded Refrigerators it will be 300% higher.

RESEARCH OBJECTIVES:

- To study e-waste management practices.
- To study e-waste management practices in Indore & Rewa.
- To study EPR Rule, 2016.
- To study EPR Rule, 2016 implementation in Indore & Rewa.
- To find causes of e-waste mismanagement in Indore & Rewa.
- To suggest best strategies for e-waste management in Indore & Rewa.

METHODOLOGY ADOPTED

To know the disposal practices in India a survey has been conducted in two cities namely Indore and Rewa in Madhya Pradesh. The survey has been done in two steps which are given below:

- [1] Secondary Data Collection.
- [2] Primary Data Collection.

3.1 Secondary Data Collection:

To know the current e-waste management practices authorized e-waste re—cycler & dismantler is being approached to find out what these scrap dealer do with the e-waste collected from households, shops and offices. The data obtained is tabulated and represented below. This data will be our base for further study. The findings obtained could be described as a process which includes following steps:

Step 1: Sourcing by informal recyclers- In this step the e-waste is collected by informal scrap dealer from household and business. The household sell e-waste to second hand market or to showroom owner/retailers in exchange schemes. Sometimes scrap collector directly collect the e-waste from household. Informal scrap collector collects e-waste also from government organization or business firms by participating in auction or by directly approaching the offices or through exchange scheme.

Step 2: Aggregation- After the e-waste collected by scrap dealer they checks the material receive and divide it into three part as material which can be resold in second hand market as first part, second part include items which could be repaired or refurbished and resold and third part consist of what is to be sent for recycling.

Step 3: Segregation & dismantling- Those parts of e-waste which cannot be resold in original form are dismantled either by scrap collector himself or sell it to a dismantler. The dismantling of only electrical and electronic products mainly fridge, TV, and washing machine are performed at local level. Most of the computers and mobiles could not be dismantled here and are taken by e-waste collector from Delhi where dismantling is done by experts of informal sector. After dismantling the product, the components are again checked to know if any part or components could be reused. The reusable components or parts are sold at higher price as compared to non reusable part.

Step 4: Recycling- After segregating and dismantling the waste electronic product the parts which could not be resold are recycled.

Each stage workers are expertise in their job and perform the specific job. Most of the recycling job is performed by informal sectors.

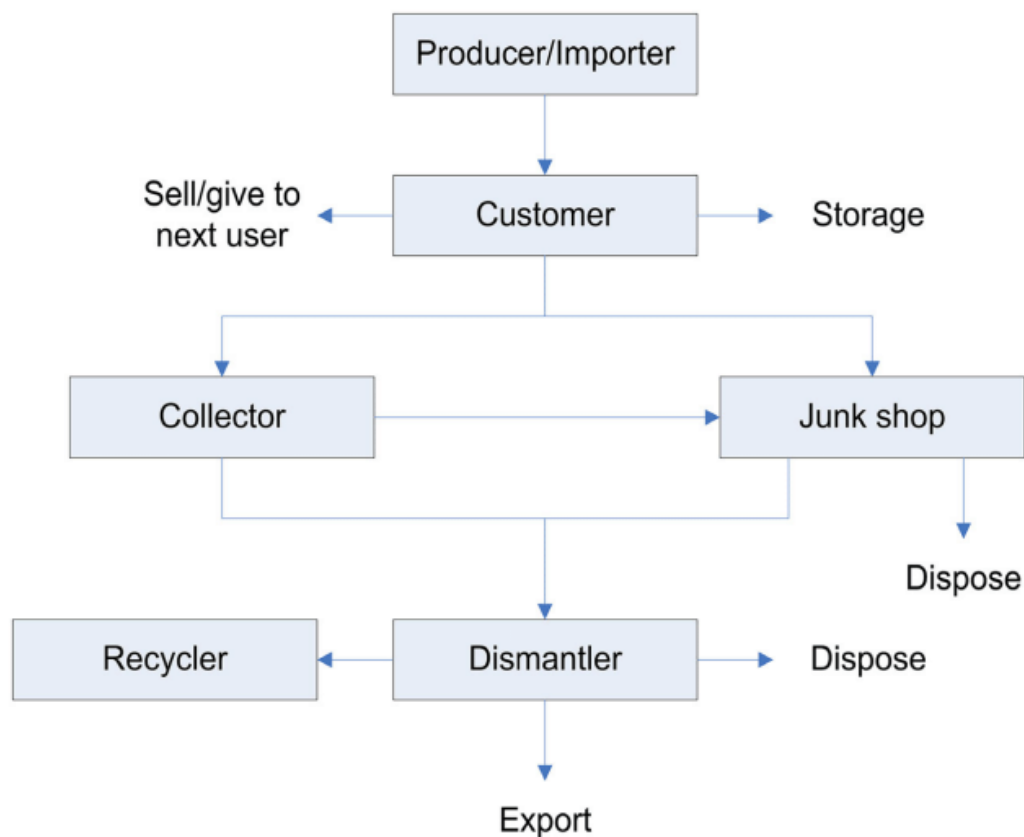


Figure : Different Stack-holders in e-waste management.^[1]

Table 1

S. No.	Name & Address of Collection Centre/Dismantler/Recycler	Authorized capacity (in MT/Year)	Collected e-waste during Year 2015-16
1.	M/s UNIQUE ECHO RECYCLE, PLOT No. 26, BEHIND SITA SHRI INDUSTRY, NEMAWAR ROAD, PALDA, INDORE (M.P.) DISMANTLER/RECYCLER	6000 MT/Year	198.0 MT
2.	M/s HOSTECH ECO MANAGEMENT PVT. LTD (E-WASTE RECYCLING UNIT) PLOT NO. 27, SEC-C, INDUSTRIAL AREA, SANEWAR ROAD INDORE (M.P.) DISMANTLER/RECYCLER	7020 MT/Year	6.0 MT/Year
3.	M/s BEST (I) PVT. LTD. 204-B BLOCK II FLOOR, SILVER MALL R.N.T. MARG INDORE (M.P.) COLLECTION CENTRE	0.72 MT/Year	0.01057 MT/Year
4.	M/s SMS E-WASTE (FORMERLY UNIQUE ECHO RECYCLE COLLECTION CENTRE) 41, SIKH MOHALLA M.G. ROAD NEAR KOTHARI MARKET, INDORE (M.P.) COLLECTION CENTRE	120 MT/Year	0.328 MT/Year
5.	M/s BHARTI AIRTEL LTD., SURVEY No. 100/2 TCIXPS SUPPLY CHAIN, OPPOSITE SHIPRA THANA, A.B. ROAD GRAM PIRKARADIYA INDORE (M.P.) COLLECTION CENTRE	6.0 MT/Year	32.0 MT
6.	M/s ETA GENERAL PVT. LTD. C/o ADITYA AGENCIES, PLOT No. 111 S.R. COMPOUND, DEWAS NAKA, INDORE (M.P.) COLLECTION CENTRE	4.0 MT/Year	0.184 MT
7.	M/s ATTERO RECYCLING PVT. LTD. C/o SEQUEL LOGISTICS PVT. LTD., TNS COMPOUND NEAR BALAJI TOLL KANTA, NEAR LASUDIA MORI POLICE STATION INDORE (M.P.) COLLECTION CENTRE	300 MT/Year	73.07 MT

Collection of Primary Data-

To collect primary data a survey is conducted. The sample size of this survey is 15 i.e. fifteen stakeholders in each category are interviewed and the result is published in following tables. Categories are divided using the result of secondary data which we have attained from MPPCB report. For collection of data interviewing technique was used and necessary data was obtained. Apart from this the only e-waste re-cycler in MP M/s Unique Eco Recycle, Indore.

- Group 1 – Laptops & laptop Accessories sellers.
- Group 2 – Mobile handsets and mobile Accessories sellers.
- Group 3 - E & E Goods sellers.

Data Collection, Analysis and Results:

The survey conducted has mainly four inputs. These are as follows:

- ¹ Awareness level about e-waste and its management among different sellers.
- ² Fate (Handling) of e-waste received from purchaser.
- ³ Awareness about EPR (Extended Producer Responsibility) rules, 2016.
- ⁴ Suggestions for effective e-waste management.

II. Awareness level about e-waste and its management among different sellers.

The data regarding e-waste management awareness was collected by asking questions like

1. Have you heard of e-waste ?
2. What do you know about e-waste?
3. e-waste vs solid waste?
4. Do you know about e-waste Collector, Dismantlers and Recyclers?

Based on the responses provided by the sellers, Rating was given from 1 to 10. table has been built and result is also presented graphically for better understanding.

Table 2

Awareness level regarding e-waste	No. Of Group-1 respondents	No. Of Group-2 respondents	No. Of Group-3 respondents
Solid knowledge	2	4	1
Shallow knowledge	12	9	11
No knowledge	1	2	3

III. Fate (Handling) of e-waste received from purchaser

The sellers of every group i.e. group-1, group-2, and group-3 are running exchange schemes so this way they obtain e-waste. Also, many customers return useless e-materials to sellers. When we asked regarding future of this e-waste they responded as follows.

Table 3

Handling of e-waste	Group-1	Group-2	Group-3
Sell to e-waste collector	2	4	1
Sell to scrap dealer	13	11	14
Producer recycling support	N-14/Y-1	N-15/Y-0	N-13/Y-2
Availability of exchange facility	Y-10/N-5	Y-12/N-3	Y-11/N-4

IV. Awareness about EPR rule 2016

This question was asked in yes or no form. Response is tabulated as follows:

Table 4

Awareness about EPR, 2016	Group-1	Group-2	Group-3
Yes	3	5	3
No	12	10	12
Total	15	15	15

V. Suggestion for Effective e-waste management:

In the course of survey different groups and different product sellers have provided different suggestions which have been collected and organized in tabular form in different categories.

Table 5

S. No.	Seller Suggestion	Group-1	Group-2	Group-3
1.	Increase no. of e-waste collection and recycling centers.	7	6	2
2.	Govt. Responsibility to implement EPR rules effectively.	6	4	4
3.	Increase e-waste awareness among people.	1	3	3
4.	Company should provide buy-back option for old used products.	1	2	5
5.	No suggestions	0	0	1

RESULTS:

It can be analyzed from the Table 2 that 13% laptop sellers, 27% mobile handset sellers and 7% E & E sellers have solid knowledge about e-waste management that means they know the process of e-waste generation, its collection and segregation, recycling, and environment friendly dismantling and disposal.

Apart from this 80% laptop sellers, 60% group-2 sellers, and 74% group-3 sellers have shallow knowledge regarding e-waste management. It means they know what e-waste is and how it is generated but they have lack of awareness regarding eco-friendly disposal of e-waste.

While there are a few respondents who have no idea regarding e-waste at all. To be precise only 1% of laptop sellers, 13% handset sellers and 19% Electrical and Electronic equipment sellers are oblivious about e-waste.

From Table 3 we can observe most of the e-waste collected by each group lands to scrap dealers. They sold this e-waste to unauthorized and unorganized dismantlers. Around 85% of total e-waste of group-1 members goes to scrap dealer. Similarly, 75% of total e-waste in group-2 strata goes to scrap dealers. Humongous 94% of total e-waste of group-3 goes to scrap dealers. This stats clearly express the precarious situation of e-waste management in India.

There is lack of recycling support from producer as we can clearly examine from the above table that most of the responses regarding recycling support were negative. Only 3 out of 45 respondents said that producers provide recycling support.

Around 70% laptop sellers, 80% mobile phone sellers and 70% E & E sellers provide exchange facilities. But they complained due to lack of organized e-waste collector we sell dangerous e-waste to scrap dealers.

Table 4 results show only 20% response in group-1, 33.33% in group-2 and 20% in group-3 responded positively. It means that only one fourth of the total correspondents know about EPR and remaining three-fourth respondents have no idea about EPR at all. Even after 3 years of formation and legislation of EPR rules very few people know about this.

Recommendations :

It can be concluded from above Table 5 that around 46% computer sellers, 40% mobile headset sellers and 15% Electrical and Electronic product sellers want to have higher number of e-waste collection centers and they were demanding door to door e-waste collection similar to solid waste door to door collection approach. It was very clear from survey that many more e-waste collection centers are required.

It was also seen that 40% laptop sellers, 27% headset sellers, and 27% E & E sellers were putting more onus on government. They were suggesting that there should be proper implementation of Extended Producer Responsibility Act 2016 so that manufacturers become more responsible and recognize that it is their duty to dispose e-waste generated by them.

There is another group of respondent who were demanding there should be proper e-waste awareness program so that more and more people become aware of e-waste threats. Around 7% Group-1, 14% Group-2, and 35% Group-3 were suggesting there should be increased e-waste awareness among people.

It was also observed 7% laptop sellers, 14% mobile headset sellers and 35% E & E were stating company should provide buy-back option for old used products.

There were also some who did not provide any suggestion mainly due to privacy concerns.

Important suggestions may be listed as below:

- I. Increase the number of e-waste collection and recycling centers.
- II. Govt. Responsibility should be higher to implement EPR rules effectively.
- III. Increase e-waste awareness among people.
- IV. Company should provide buy-back option for old used products.

CONCLUSION:

As we have found from secondary data only two e-waste recycler/dismantler are available in M.P. And these centers are getting around 10% e-waste of their installed capacity. On primary survey we have seen there is dire need of more e-waste Collectors, Dismantlers, Re-cycler.

From above disparity we can clearly state that huge amount of e-waste is either mixed with solid waste or sold to unorganized sector where proper e-waste management practices are not followed. This practice is very dangerous for environment and health.

Similarly when surveyed about EPR, 2016 Rule implementation not a single company is implementing this properly. So there is dire need of strictly implementing EPR, 2016. Government may provide some incentives to the organization which are implementing EPR, 2016 properly.

When we collected primary data we got to know clearly the loopholes present in e-waste management practices. Since some unorganized sector scrap dealers are purchasing their e-waste from their door, while in case of authorized e-waste dismantlers users have to pay money for their e-waste handling as e-waste handling charges.

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