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"Collection of E-waste from Jabalpur City": A Case Study

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Abstract

Electronic waste or E-waste is relatively a novel addition to the ever-growing hazardous waste stream. This paper tries to quantify the amount of E-waste generated in Jabalpur with the related local scrap vendor's involvement. Electronic waste (E-waste) or Waste of electrical and electronic equipments (WEEE), which is relatively a recent addition to the hazardous waste stream, is drawing rapid attention across the globe as the quantity being generated is rising rapidly. All electrical and electronic equipments (EEE), on completion of their useful life, contribute to the E-waste stream. However, the current estimation of the amount of E-waste generated in Jabalpur is extremely indistinctly. In this paper, an attempt has been made to formulate an inventory of E-waste in the city in terms of local scrap vendor's and illegal import. Different methods of estimation of E-waste have been evaluated. Furthermore, the paper tries to identify the whole range of diverse of local scrap vendors involved in the generation of E-waste in the city. It has been observed that actual and reliable data on the E-waste, both domestic and corporate data export of E-waste, is currently unavailable in Jabalpur. Few studies have been conducted to identify the involvement of different local scrap vendor's in E-waste in the city. Urgent needs arise to document the issues related to E-waste generation and management in the city in order to deal with this important and toxic waste stream.

Key words: *Domestic generation, E-waste generation, inventory, scrap vendors.*

1. Introduction

The manufacturing of electrical and electronic equipment (EEE) is one of the emerging global activities. The main factors identified to be responsible for the increased consumption and productions of electrical and electronic equipment are rapid economic growth, coupled with urbanization and industrialization. The Indian Information Technology (IT) sector is one of the major contributors to the global economy. At the same time, it is responsible for the generation of the bulk of E-waste or Waste Electrical and Electronic Equipment (WEEE) in India. According to recent studies carried out by Manufacturer's Association of Information Technology (MAIT) and the Gesellschaft für Technische Zusammenarbeit (GTZ) in 2007 about 3,80,000 tons of e-waste are generated annually in India. Although the global E-waste problem has been able to attract attention across the world, not much emphasis has been given to the E-waste engendered in developing countries. Developing countries like India, today, is burdened with the colossal problem of E-waste which is either locally generated or internationally imported, causing serious menace to human health and environment. The hazardous components in electrical and electronic equipment are a major concern during the waste management phase. In the context of India, recycling of Waste Electrical and Electronic Equipment is not undertaken to an adequate degree. However, one of the major issues related to E-waste is that there is no standard definition of WEEE/E-waste. A number of countries have come out with their own definitions, interpretation and uses of the term "E-waste/WEEE".

1.1. Definitions of electronic waste

Electronic waste or e-waste for a short generic term embracing various forms of electric and electronic equipment that have ceased to be of any value to their owners. There is, as yet, no standard definition. Table 1 lists selected definitions. In this article, we use the terms WEEE and e-waste synonymously and in accordance to the EU WEEE Directive.

Table 1: overview of selected definitions of WEEE or e- waste

Reference	Definition
EU WEEE Directive (EU, 2002a)	Electrical or electronic equipment which is waste. . . including all components, sub-assemblies and consumables, which are part of the product at the time of discarding. Directive 75/442/EEC, Article 1(a) defines waste as any substance or object which the holder disposes of or is required to dispose of pursuant to the provisions of national law in force.
Basel Action Network (Puckett and Smith, 2002)	E-waste encompasses a broad and growing range of electronic devices ranging from large household devices such as refrigerators, air conditioners, cell phones, personal stereos, and consumer electronics to computers which have been discarded by their users.
OECD (2001)	Any appliance using an electric power supply that has reached its end of-life.
SINHA (2004)	An electrically powered appliance that no longer satisfies the current owner for its original purpose.
StEP (2005)	E-waste refers to . . .the reverse supply chain which collects products no longer desired by a given consumer and refurbishes for other consumers, recycles, or otherwise processes waste.

The most widely accepted definition and description of WEEE/ E- waste is as per the European Union directive. The Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste. Electrical and electronic equipment (WEEE) covers all electrical and electronic equipment used by consumers. Categories of electrical and electronic equipment covered by this Directive within ANNEX IA are as follows:

1. Large household appliances
2. Small household appliances
3. IT and telecommunications equipment
4. Consumer equipment
5. Lighting equipment
6. Electrical and electronic tools (with the exception of large-scale stationary industrial tools)
7. Toys, leisure and sports equipment
8. Medical devices (with the exception of all implanted and infected products)
9. Monitoring and control instruments
10. Automatic dispensers

A wide range of products are included within each category mentioned above:

In India, E-waste is covered in Schedule 3 of "The Hazardous Wastes (Management and Handling) Rules, 2003". Under Schedule 3, E-waste is defined as "Waste Electrical and Electronic Equipment including all components, sub-assemblies and their fractions except batteries falling under these rules". "Guidelines for Environmentally Sound Management of E-waste" formulated by the Ministry of Environment and Forest, Government of India, in the year 2008 followed the same definition. According to the very recent "the e-waste (Management and Handling) Rules, 2011", 'electrical and electronic equipment' means equipment which is dependent on electric currents or electro-magnetic fields to be fully functional and 'e-waste' means waste electrical and electronic equipment, whole or in part or rejects from their manufacturing and repair process, which are intended to be discarded.

A wide range of literature is available on the generation and management of E-waste, especially in the developed countries. However, the work done on the Indian scenario of E-waste management is comparatively fewer.

2. Methodology

The study was conducted in the framework of "Collection of E-waste data". The data is collected from two sites in Jabalpur city i:e Gurandi Market and Raddi Chowki from the dismantling unit of local scrap vendors , including the categories of Waste Electrical and Electronic Equipment WEEE/E-waste. Waste is regarded as that matter which is to be discarded or made to disappear, often by simple means of removal such as refuse collection, landfill dumps, incineration etc. According to Loon (2002), waste is perhaps the most universal example of ecological risks in everyday life. Nearly all ecological risks relate in one way or another to waste, more specifically to pollution. One can have the example of "solid-waste pollution" in this regards. Whether it is nuclear waste, biomedical waste or electronic waste, risks are always embedded in the materials involved in these waste. Two of the reflections specified by Loon are considered for the purpose of the study. The reflections are Principle of "Out of Sight, Out of Mind" and "Cause and Effect" Relationship. Attempt has been made to connect these reflections to the problem of E-waste.

2.1. Principle of "Out of Sight, Out of Mind"

The principle of out of sight, out of mind has for a long time been useful in keeping the lid on the negative side-effects of industrialization (Loon, 2002). During this period, toxicity was allowed to build up in the soil, in the air and in the water. This principle is applied to the issues related to E-waste in Indian context. Most of the people in India do not know how to dispose their obsolete electrical and electronic gadgets. Few people practice "extended producer responsibility" and indulge themselves in "take-back" systems. But none of these consumers pay attention to the processes these electronic goods have to go through once these are discarded. The real trouble with electronic goods actually begins once discarded. As soon as the wastes are out of their sight, these are out of their minds too.

2.2. "Cause and Effect" Relationship

The relationship between cause and effect is important in all kinds of waste. The reasons for prompt generation and obsolesces of E-waste include rapid economic growth, urbanization, industrialization, increased consumerism etc. The effects are the health and environmental risks associated with E-waste. The effects of improper disposal of E-waste are observed relatively after a long period of time. It takes considerable amount of time to have an outlook of the actual risk from the waste. This intensifies the problem of realization of the hazards from waste.

3. Conclusion

"In the year 2015, the study of e-waste collection is conducted in two areas of Jabalpur i:e Gurandi market and Raddi chowki. 90% of e-waste collection was found in these areas from different sources. In the year 2015, 1,75,000 kg e-waste (WEEE) generated in this city, collected in (table 2). E-waste data was collected from local scrap venders. The all e-waste exported to Delhi because no e-waste recycling unit is present in Jabalpur.

Table 2: E-waste collection in Jabalpur

S. No	Area/ Location		No. of Months											
			Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep
1	Gurandi Market	1	3300	2650	1850	1700	1360	1200	1050	900	800	690	640	1100
		2	2500	2400	2200	1900	1700	1500	1300	1200	1000	800	630	1200
		3	4000	3600	3300	2850	2600	2480	2350	2200	1950	1250	1000	1450
		4	3200	3000	2700	2300	2100	1650	1350	1250	1150	850	750	1250
Sum			**13000**	**11650**	**10050**	**8750**	**7760**	**6830**	**6050**	**5550**	**4900**	**3590**	**3020**	**5000**
2	Raddi	5	3500	3200	3000	2700	2600	2200	2000	1800	1700	1000	800	1600

	Chowki	6	2000	1800	1750	1740	1680	1620	1530	1430	1400	730	600	1400
		7	3000	2800	2700	2600	2500	2000	1500	1300	1000	700	1200	2000
		8	2820	2750	2600	2500	2300	1900	1600	1300	1100	800	600	1500
Sum			**11320**	**10550**	**10050**	**9540**	**9080**	**7720**	**6630**	**5830**	**5200**	**3230**	**3200**	**6500**
Total			**24320**	**22200**	**20100**	**18290**	**16840**	**14550**	**12680**	**11380**	**10100**	**6820**	**6220**	**11500**

The high monetary margin is driving force to e-waste trade (Stricher-Porte and Yang, 2007); depending on value of scraps, wastes may be recycled locally for valuables and remaining less- or non-valuable materials/components are exported to other countries for further processing and landfills (Terazono et al., 2006; 2007); and the growing demand for recyclable resources is also an essential contributor to encourage growing trade in recyclable wastes (Hicks et al., 2005). E-waste divided in different categories viz., Cable wire, Glass, Plastic, Metals, Circuit plates, Miscellaneous. Maximum e-waste generate in the form of Plastic (30%), Cable wire (20%), Metals (18%), Glass (15%), and Circuit plates (12%) as follows Miscellaneous items found in very low amount 5% (Table 3 and Fig. 1)

Table3: The total amount of different ingredients of e-waste are as follows:-

S.No.	Categories	Weight in (kg)	E-waste generation in (%)
1	Cable Wire	35607	20
2	Glass	25676	15
3	Plastic	52008	30
4	Metals	31652	18
5	Circuit Plates	21074	12
6	Miscellaneous	8983	5
Total		1,75,000	100%

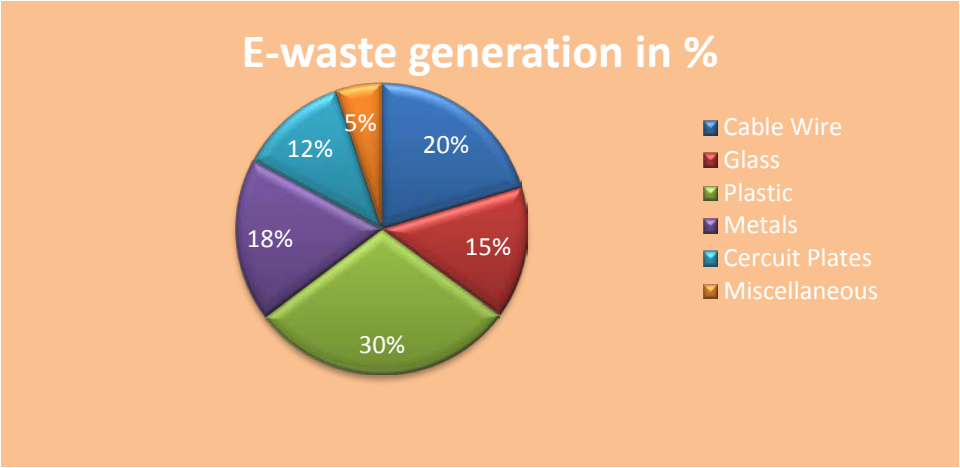

Fig. 1 E-waste generation in percentage (%)

Maximum e-waste generated in the month of October, November and December because this is the festival season mainly Diwali. In this season the waste are increased in high amount of selling the waste through the people to the scrap vendors from the houses, therefore in the month of September a constant situation is obtained in both areas, then after month wise production level is decreased in the month of rainy season, e-waste production is very low in amount are found. After the rainy season the e-waste production is again rapidly in growth.

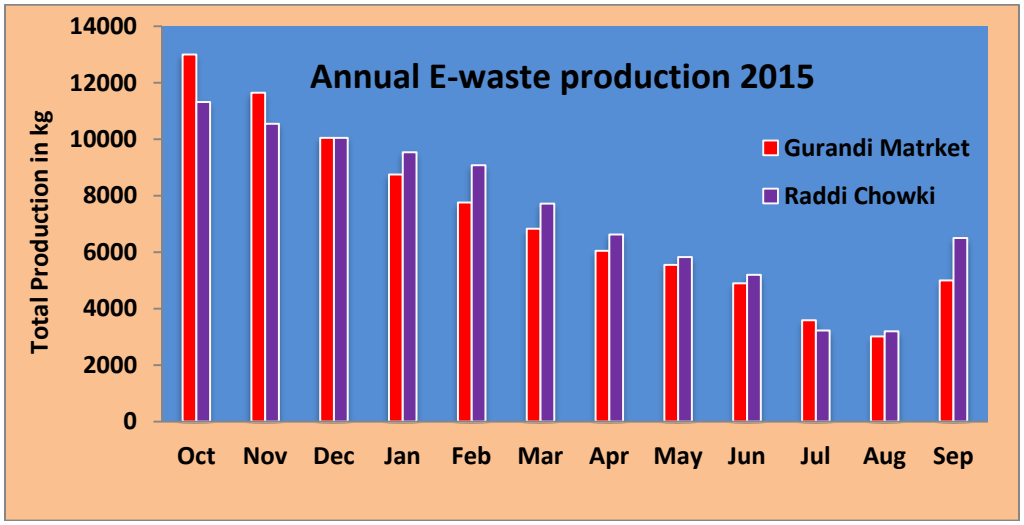

Fig.2 Month wise e-waste data collection

In Jabalpur, the amount of E-waste generated is rising rapidly. With the increasing dependence on electronic and electrical equipment, the rise of E-waste generation is well expected in the city. However, the management of the same is a major challenged faced by the city. There are no authorized small E-waste dismantling facilities in Jabalpur. But as for example, in M.P there are authorized small E-waste dismantling facilities functioning is Eco Management Pvt. Ltd and M/s Unique Eco Recycle unit at Indore. There is no large scale organized E-waste recycling facility in India and the entire recycling exists in unorganized sector. The lack of public awareness regarding the disposal of electronic goods and inadequacy of policies to handle the issues related to E-waste enhance the problem in India. In most of the cases, the bulk of E-waste remains unattended in households and public offices. Rarely some sectors like some of the IT companies practice Extended Producer Responsibility or Take Back Policies. People tend not to care about the faith of the waste once these are discarded, thus satisfying the principle of "out of sight, out of mind". Proper implementation of the "e-waste (Management and Handling) Rules, 2011" is exceedingly essential to address the ever-growing pile of E-waste in the country.

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