

A PEEP INTO THE WORLD OF ELECTRONIC WASTES: THEIR GENERATION, DISPOSAL AND RECYCLING IN THE CITY OF KOLKATA, WEST BENGAL

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ABSTRACT

The use of electrical and electronic equipments is considered as one of the parameters of socio-economic development of any country. These electronic items produce electronic waste popularly known as E-waste which is discarded in huge quantities from business establishments as well as from domestic households. These wastes not only affect the environment adversely but also contribute to human health hazards as well. The E-waste recycling industry shows inadequate development in respect to huge generation of the waste which is capable of posing potential threat to environment and man. The study is an attempt to show the problems related to the generation of electronic waste, methods of disposal and recycling of these wastes in the city of Kolkata highlighting on its hazardous impact both on the environment as well as on human beings.

Keywords: Electronic Waste, Socio-Economic Development, Electrical and Electronic Equipments, E-Waste Tenders, Waste Recycling, Waste Management

INTRODUCTION

Electronic Waste or *E-waste* refers to discarded electrical and electronic equipments (EEE). These include computers, electronic equipments, devices, mobile phones, television sets, compact discs, refrigerators and other items that have been discarded by their original users. These wastes include those electronic devices and goods which are destined for reuse, resale, recycling and disposal. The reusable includes the working and repairable electronic items. The E-waste management guidelines provided by Government of India defines E-waste as : "E-waste comprises of wastes generated from used electronic devices and household appliances which are not fit for their original intended use and are destined for recovery, recycling or disposal. Such wastes encompass wide range of electrical, electronic devices such as computers, cellular phones, personal stereos including large household appliances such as refrigerators, air conditioners etc". The reasons behind huge generation of e-waste worldwide can be attributed to the fact that technology has been rapidly changing every day, what has been new yesterday is obsolete today. The falling prices and planned obsolescence have resulted in a fast growing surplus of e-waste across the globe. In USA alone 30 million computers are discarded every year while in Europe 100 million phones are disposed annually. The growth rate of e-waste has been tremendously high in India as well, since the country has emerged as a giant in the field of information technology in past few years.

OBJECTIVES OF THE STUDY

The study has been initiated to fulfill the following objectives:

- To study the type and composition of E-waste generated within the city of Kolkata

- To show the various disposal practices of these wastes
- To focus on the recycling techniques of the hazardous components of the wastes
- To highlight on the hazardous impact of these wastes on man and environment

Area under Study

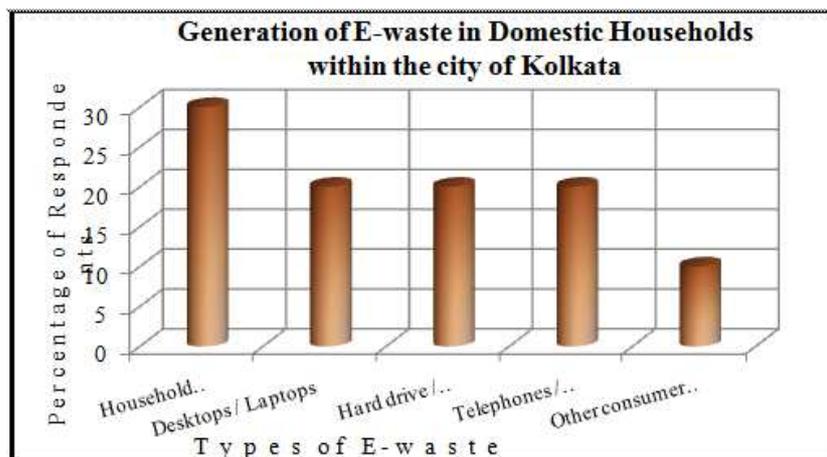
The State of West Bengal has 20 districts among which the city of Kolkata holds a place of significance both in the field of administration and commercial activities. The city is under the administrative jurisdiction of Kolkata Municipal Corporation. The Kolkata Municipal Corporation has a total area of 187.33 sq. km with a geographical extension of 22°27'N to 22°39'N latitude and 88°14'E to 88°26'E longitude. The territorial jurisdiction of Kolkata Municipal Corporation (KMC) has been divided into 15 Boroughs consisting of 141 municipal wards. Spatially the city can be divided into North, East, Central and South Kolkata. The district of Haora lies to the North-West, North 24 Parganas on the Northern and North-Eastern side and South 24 Parganas on the South-Eastern and South-Western side. The River Hugli flows through Western part of the city.

MATERIALS AND METHODS

The study has been accomplished through both primary and secondary data. The secondary data has been collected from various Government and Nongovernment sources. Numerous reports of Central Pollution Control Board (CPCB) and West Bengal Pollution Control Board (WBPCB) have been consulted for the purpose. Apart from these a number of articles from various journals related to the topic have been considered. The primary data has been generated through questionnaire survey conducted in 15 Boroughs of the city consisting of 141 municipal wards. The survey has been carried out in domestic households and a number of business establishments within the city to know about their role in the generation of e-waste, their method of disposal and various environmental problems faced by local residents due to indiscriminate disposal. Lastly, the secondary and the primary data has been computed and represented through cartograms followed by analysis and interpretation.

A Discussion on Generation, Disposal and Collection of E-waste in Kolkata

The electronic wastes are generated from domestic households as well as business establishments and industries within the city of Kolkata. Being an urban area the city generates these wastes in high amount every day. The types of e-waste generated mainly includes the television sets, monitors, desktops, laptops, compact discs, printers, household appliances like refrigerators, mixer grinders, sandwich makers etc from domestic households (Figure 1).



Source: Primary data, 2013-14

Figure 1

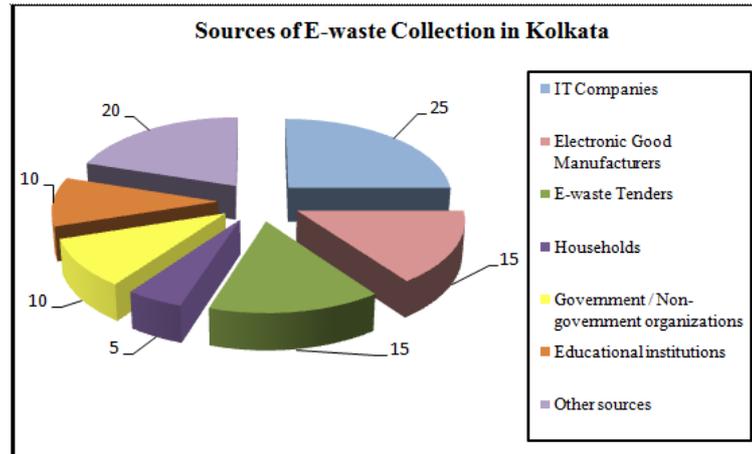
The composition of these wastes includes plastics and metals like iron, copper, nickel, lead etc. These metals when disposed indiscriminately along roadside or in water bodies contribute to soil and water pollution (Table 1).

Table 1: Composition of E-Waste

Composition	Percentage Value
Plastic	30
Refractory Oxides	30
Copper	20
Iron	08
Tin	04
Nickel	02
Lead	02
Aluminium	02
Others	02

Source: Basel Action Network, Sodhi, M.S and Reimer,B (2001)

The e-wastes generated from industries and business establishments include monitors, printers, hard drives, floppy drives, telephones, scanners, fax machines etc. Nearly 25 per cent of the e-wastes are collected from Information technology based companies and business establishments within the city. These are scattered in all the municipal wards with varying numbers. The e-wastes generated from these companies are comparatively huge in amount. Their percentage contribution to the total waste generation is highest when compared with other categories. The electronic good manufacturing companies like bulbs, lights and wire manufacturing companies contribute about 15 per cent of the total waste collection as found during field investigation (Figure 2).

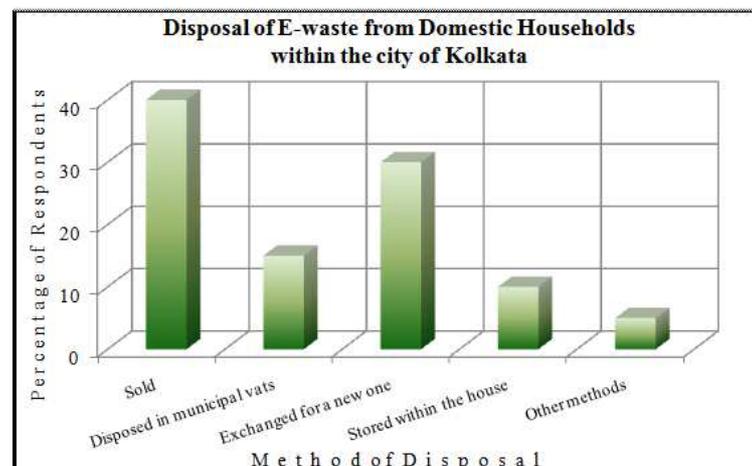


Source: Primary data, 2013-14

Figure 2

The e-waste tenders contribute to 15 per cent of the total waste collected from various sources. The small establishments of the e-waste tenders are scattered all over the city with maximum concentration seen in the *Chandni chowk* area under ward no. 46. The domestic households in the city contribute to 5 per cent of the total waste collected. In the modern age of technology the presence of various interesting electronic devices and gadgets are a common picture seen in almost all households in the city. The Government and Nongovernment organizations and educational institutions incorporating schools, colleges and universities contribute to 10 per cent of the wastes collected each within the city of Kolkata.

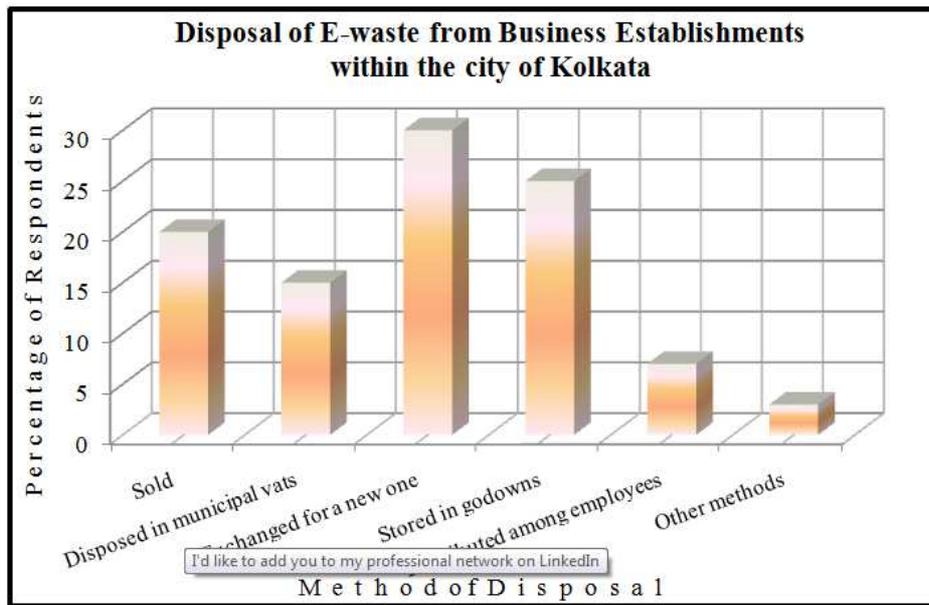
The generation of e-waste is huge in the city while proper disposal methods are not followed by domestic households as well as by the offices and institutions. The dominant method of disposal of these wastes by domestic households is by selling these items to e-waste tenders. Nearly 40 per cent of the households discard these items by selling them at low prices. 15 per cent of the households directly throw these items in nearby municipal vats and other collection bins on road. Nearly 30 per cent of the respondents were of the opinion that they exchange their items through various lucrative offers and discounts and buy a new one after successful exchange. Many of these devices are kept in the house and not sold like hard drives for the fear of losing personal information (Figure 3).



Source: Primary data, 2013-14

Figure 3

The industries and offices mainly store their discarded electronic devices and equipments in godowns and store-rooms which is the second dominant method seen for disposing these items. Nearly, 25 per cent of the business establishments follow the method of preservation of these items for the fear of losing confidential data. About 30 per cent of these offices and commercial institutions exchange the obsolete items for a fresh one at attractive offers. A small proportion of the companies follow the norm of distributing or selling the old electronic items at cheap rate among their employees. The items like old desktops, scanners and printers are sold or distributed among company workers at extremely low price (Figure 4).



Source: Primary data, 2013-14

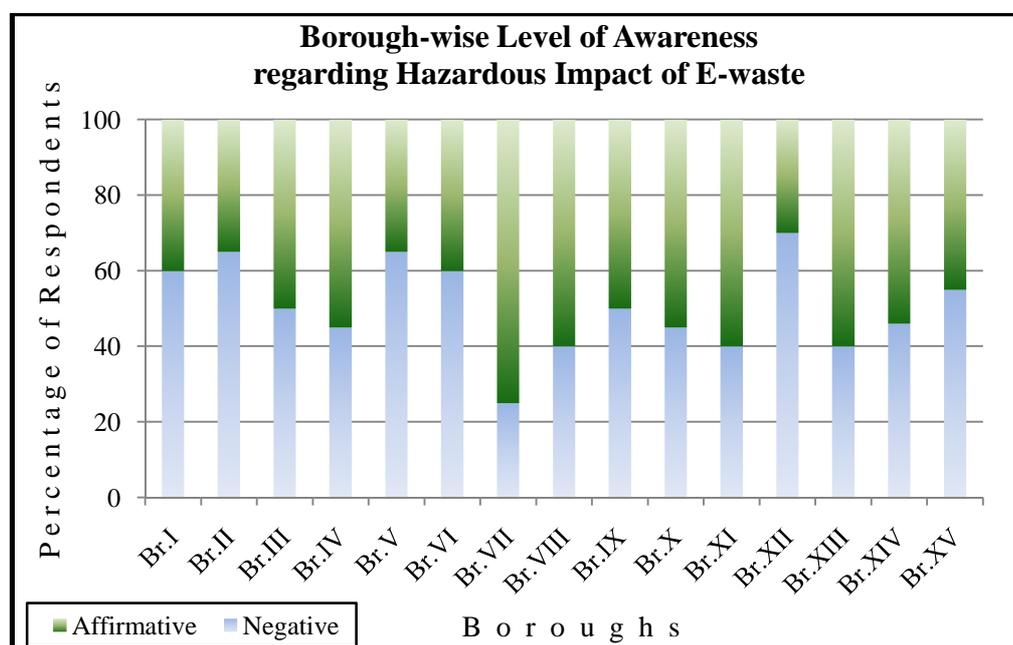
Figure 4

Hazardous Impact and Necessity of Recycling of E-waste in Kolkata

The E-waste and its components are considered as hazardous wastes because of the presence of elements like Lead, Mercury, Arsenic, Cadmium, Selenium, Hexavalent Chromium and Flame-retardents beyond threshold limits. The Halogenated substances, Polychlorinated Biphenyls, Plastics and Circuit boards that contain brominated flame retardants (BFRs) which can give rise to dioxins and furans during incineration are also found within these wastes. Other substances like Copper, Arsenic, Asbestos, Nickel etc can act as catalyst to increase the formation of dioxins during incineration. This has created a level of concern for the scientists regarding the hazardous impact of E-waste. The study has revealed that in majority of the Boroughs in the city the people are not at all aware regarding the hazardous impact of the e-waste which can cause environmental pollution besides posing serious threat on human health (Fig.5). During treatment and land filling the pollutants from these wastes find their way to the soil, water and air. These pollutants might seriously affect the health of the recyclers who treat the waste – by entering their body through respiratory tracts, skin or the mucous membrane of the mouth and the digestive tract.

The e-waste trade chain start with the generation of the waste in households and business establishments. The wastes are disposed, sold, exchanged or collected by e-waste tenders. These items and devices are dismantled and finally processed and recycled. The scrap collection starts from domestic households ranging from single nuclear families in

single dwellings to joint families in big apartments and bungalows. A huge amount of scrap is also collected from industries ranging from large-scale to small-scale units.



Source: Primary data, 2013-14

Figure 5

There are a number of e-waste recycling industries located in various municipal wards within the city. A number of shops and outlets of e-waste tenders are located in *Chandni chowk* area. Here the electronic items are sold, repaired and exchanged by the customers. A wide category of electronic items ranging from television sets, cd, vcr, dvd players, computer parts, mobile phones etc are repaired as well as sold and exchanged. Similar shops of e-waste dismantlers and tenders are noticeable in locations like Grey Street, Princep Street, Hazra area, Girish Park and Bondel gate area.

Findings from the Study

The electronics industry is the largest and fastest growing manufacturing industry in the world. The industry has recorded a rapid growth in recent years both in developed as well as developing countries. Indian market and economy being one of the fastest growing economies in the world, the country has emerged as one of the giants in the field of science and technology. The Indian electronic goods have laid a tough competition for other countries in the international market. Various countries have chosen India for outsourcing their products since skilled as well as specialized human resource is readily available here at considerable payment package. This boosting industry in Indian economy has certain environmental impact as well. The preliminary study carried out by National WEEE task force in 2005 suggested that total e-waste generation in India is approximately 146,000 tonnes per year. A survey conducted by Central Pollution Board during 2005 had estimated that 1.34 lakh mt of e-waste was generated in the country. The generation of these wastes has been huge in major Indian cities like Hyderabad, Bangalore, New Delhi, Mumbai, Chennai, Kolkata etc.

The study conducted within the city of Kolkata has revealed like other mega cities of India this city too suffers from the problem of e-waste. The generation of these wastes from business establishments both from large multinational companies to small business houses has been quite huge. The proper disposal methods are not followed in majority of the

areas leading to their indiscriminate disposal along roadside, in local water bodies etc. Sometimes these wastes are dumped in municipal vats without segregation of the harmful components. The e-wastes may contain certain toxic metals and chemicals which has the potentiality of causing environmental pollution. The type of pollution these wastes are likely to cause includes soil, water and solid waste pollution. The huge disposal of these wastes along roadside has contributed to visual pollution as well. The various types of pollution contributed by e-waste are likely to affect human health. The potential occupational hazards from e-waste include toxicity caused by tin, lead, beryllium, cadmium which can cause skin disease and lung diseases as well. Respiratory irritation may also occur due to unknown carcinogenic impact of carbon black, dioxins etc.

The e-waste recycling industries are presently included under informal sector and they are either following small scale recycling processes or are operating under illegal conditions. The e-waste tenders operating in this city gets engaged in dismantling and sale of dismantled parts. The unorganized recycling industries are operating in Chandni market, Raja Bazar, Topsia-Tiljala belt, Phoolbagan, Grey Street and Baguiati area. The e-waste tenders play a vital role in collection of the wastes both from domestic households as well as from the business establishments.

CONCLUSIONS

In the world of technology the electrical and electronic equipments play a vital role. Their use marks the progress of civilization and indicates socio-economic development of any nation though they may prove to be highly hazardous to the environment and may adversely affect the health of human beings as well. They degrade the various elements of environment like water, soil etc and may cause pollution and environmental degradation. The generation of E-waste has increased over the last few years in all Indian cities especially in the megacities. In the city of Kolkata the generation of these wastes is quite huge in amount. The disposal methods and techniques are inadequate and in majority of the areas proper disposal methods are not followed. The local residents of the Boroughs within the city are unaware of the proper disposal methods and practices. The assessment of Kolkata's recycling industries show that these are still at basic levels. The Environmental and Occupational risks associated with these wastes within the city are not as high as the risk levels of same industries in Delhi or Mumbai where the industry is already ripe and widespread.

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