# Management of Kolkata Generated E-Wastes by Informal Economy- A Case Study of Magrahat, South 24 Parganas

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**Abstract-** **E-wastes are now becoming a major environmental problem for the world especially for the developing countries if not handled and recycled properly. Kolkata has become a major e-waste generator as well as a recycling hub in India. Magrahat I and II which are the two blocks in Diamond Harbour subdivision of south 24 Parganas district in West Bengal play an important role in the management of Kolkata generated e-waste. The dismantling, recycling and the process of reuse of e-waste by informal sector in Magrahat, South 24 Parganas is reviewed through unstructured questionnaire administered to workers and by photo documentation. Workers of informal economy are engaged in various e-waste management activities without adequate protection and safeguards in recycling workshops in various places in Magrahat which bring great damage to their health and local environment.**

*Keywords: E-waste management, Kolkata, Informal economy, Magrahat, Recycling, Reusing*

## I. INTRODUCTION

With the advancement of technology and the rising 'throwaway culture' among the users, the electronic waste or e-waste has become one of the rapidly growing environmental problems of the world especially for the underdeveloped countries like India if not handled properly. As per StEP white paper 2014, E-waste is defined as—"a term use to cover items of all types of electric and electronic equipment (EEE) and its part that have been discarded by the owner as waste without the intension of re-use". E-waste or electronic waste, therefore, broadly described as "discarded, surplus, obsolete, broken, electrical or electronic devices" (Rajya Sabha, 2011). ASSOCHAM-KPMG study, 2017 unfolded the fact that India is the fifth largest producer of e-waste in the world and contributes about 12 per cent to the global e-waste production. The study also said that by 2020, India's e-waste from old mobile and computers will rise by 1800% and 500% respectively as compared to the year 2007. The ASSOCHAM-Frost & Sullivan study (2016) revealed that India's e-waste is likely to reach 30 lakh metric tonnes (MT) per year by 2018 from the present level of 18.5 lakh metric tonnes (MT) with a CAGR of 27.34%. Another study by ASSOCHAM-cKinetics (June 2016) said that India is likely to generate 52 lakh metric tonnes (MT) per annum by 2020.

E-waste comprises of aluminum, cadmium, mercury, brominated flame-retardants, complex plastic blends and lead which could bring serious risk to human health and the environment if not handled properly. UNEP report 2005 revealed that –"every year 20-50 million tons of electrical and electronic scrap generated worldwide". Due to the lack of governmental legislations on e-waste, standards for disposal and proper mechanism for handling these toxic hi-tech products, either generated internally or imported illegally, mostly end up in landfills or partly thrown into waste streams and partly recycled in a unhygienic conditions in unorganised recycling yards in developing countries like India and China (UNEP report-2010), where poorly-protected workers dismantle them, often by hand, in appalling conditions. The method of dismantling and recycling of e-waste by unorganized sector released a large amount of toxic substances and polluted the local environment.

Kolkata is the biggest and the most important commercial center in eastern India and one of the most populous cities of India. The city has also become a major hub of electronic wastes. A study conducted by WBPCB, Gtz and ICC Kolkata (2010), revealed that Kolkata generates almost 58097 tonnes of e-waste annually in 2015-2016 and expected to generate 144823 tonnes in 2019-20. This study also depicts that KMA generates around 26000 tonnes of annual e-waste annually, of which 9290 tonnes is available for recycling and only 2000 tonnes get recycled. Study showed that Kolkata accounted for 35000 tons of e-waste generator in the year 2014 and ranked fifth position (ASSOCHAM-Frost & Sullivan study, 2014). As per ASSOCHAM - Frost & Sullivan, 2016 study, Kolkata ranked 5th position as e-waste generator with 55000 MT e-wastes. Thus the CAGR of Kolkata generated e-waste is

25.36% while for the first generator of e-waste- Mumbai, it is only 11.80%.

Question arises that how this large quantity of e-waste is managed as only 5% of e-waste of Kolkata is managed by the formal sector (ASSOCHAM-Frost & Sullivan study, 2016).

## II.    REVIEW OF LITERATURE

Some of the major works done in this area are noted below-

i. Toxic Link and Centre for Quality Management System, Jadavpur University (2007) revealed that Kolkata and the neighboring Howrah district have become the main hub for e-waste recycling

ii. Dalrymple and Kellner (2007) said that WEEE has been identified as one of the fastest growing sources of waste in the EU, and is estimated to be increasing by 16-28 per cent every five years.

iii. MAIT with GTZ, (2008) e-waste assessment study identified stakeholders in the e-waste value chain including the profile and practices of the formal and informal recycling facilities in the country

iv. Anandakrishnan, Jadhav and.Jagtap, (2008) stated that E-waste can not only be mitigated but also it can generate value added products with the help of newer processing technologies and scientific break-through.

v. KMC and GTZ study (2010) disclosed that the unorganized sector has better reach in collection due to the ubiquitous spread of scrap collectors and is also able to offer better prices for the e-waste

## III.    OBJECTIVES

The objectives of this paper are classified under the following sub-headings-
- To know the volume of e-waste generated by household of Kolkata
- To assess the role of the informal economy of Magrahat, South 24 Parganas in the management of Kolkata generated e-waste in terms of collection, dismantling, recycling and reuse.

## IV.    METHODOLOGY

Due to high rate of obsolesce, the study is restricted mostly on waste generated from personal computer and its peripherals, mobile phones and television sets.

**Research Design**

The study is descriptive in nature.
Exploratory survey was conducted to find out the areas at Magrahat rail station, rail station adjacent market and streets and also in Sangrampur and Tekpanja village where e-waste is handled and managed.

**Data Collection, Sampling Technique and Documentation**

Data for the study is collected from both the primary and secondary sources.

- **Primary data**

Primary data is collected on the basis of unstructured questionnaires administered to workers of informal economy of Magrahat involved in this service.

- **Secondary data**

Secondary data is collected from books, journals, corporate reports, Govt. laws and announcements as well as relevant electronic media.

- **Sampling Technique**

As there are no government agencies to keep the record of workers of informal economy engaged in e-waste management, convenience/ snowball and time-space sampling methods are used to select respondents from different e-waste processing areas.

- **Documentation**

The study is authenticated by visual documentations

A diagram is formed to find out the sources of Kolkata generated e-wastes and their way to Magrahat for recycling, reusing and refurbishing.

## V.    ANALYSIS AND FINDINGS

### a.    VOLUME OF E-WASTE GENERATED IN KOLKATA

As per Brett H Robinson, 2009, e-waste generation –

$E=MN/L$
Where, E=e-waste production/year
  L= average lifespan of the product
  M=mass of the product
  N=Number of unit in service

M=mass of the product
Based on Census 2011 data for Household ownership of TV, computer and mobile phone, total e-waste generated by household of Kolkata for these three e-goods is 7034.126 MT shown in the following table-

**Table-1- volume of e-waste of Kolkata by Household**

| Equipment | Ownership of appliances (unit) | Disposal rate (yr) | Average weight (kg) | e-waste quantity per year (MT) |
|---|---|---|---|---|
| TV | 8,16,141 | 1/5 yr * | 30 * | 4896.846 |
| Computer -With internet | 1,36,618 | 1/3 yr ** | 25 ** | 1138.843 |
| -Without internet | 1,16,026 | 1/3 yr ** | 25 ** | 966.883 |
| Mobile phone | 6,31098 | 1/2 yr *** | 0.1 *** | 31.554 |
| Total | - | - | - | **7034.126** |

*Li et al, 2009

**Betts, 2008
*** Cobbing, 2008

## b. COLLECTION, SEGREGATION, RECYCLING AND REUSE OF KOLKATA GENERATED E-WASTE IN MAGRAHAT, SOUTH 24 PARGANAS

Magrahat I and II of South 24 Parganas which are the two Community Development blocks in Diamond Harbour subdivision have become major hubs of e-waste recycling in West Bengal. Though the two blocks are primarily rural in nature but agriculture is no longer their main source of livelihood. In  Magrahat I and II ,72.26% and 70.20% of workers are involved in non-agricultural activities respectively (Human Development Report, South 24 Parganas, 2009). The high poverty ratio (28.41% in Magrahat I  and 29.26% in Moigrahat II) and the associated low standard of living (Rural Household Survey, 2005) forced them to enter into the informal economy of e-waste recycling business for livelihood.

Management of e-waste consists of three main steps: i)collection, ii) sorting/dismantling and pre-processing (including sorting, dismantling, mechanical treatment) and iii) end-processing (including refining and disposal). The efficiency of the entire system depends on the efficiency of each step and on how well the interfaces between these interdependent steps are managed.

Due to lack of number of formal sector in West Bengal and awareness among people, the informal economy dominates the e-waste management in Kolkata. Thus the mammoth quantity of e-waste is piled up at informal recycling yards mainly in Chandni Chowk, Princep Streer, Ritchie Road, Tangra and Rajabazar.

Both the blocks of Magrahat play an important role in the management of Kolkata generated e-waste. Field study revealed that most of the households of Sangrampur village of Magrahat I are involved in e-waste business- either in recycling or in metal recovery process. The activities that are found during field study in Magrahat I and II are as under-

- **COLLECTION**

Collection is the pillar of e-waste management. At Magrahat railway station it was revealed that the hawkers (*feriwalas*) collected e-waste items mainly computer and its peripherals, mobile phones and televisions from households of Kolkata at a negotiable price. After collection they sell it to kawadiwals of Kolkata (termed as "primary collectors") or directly come to Magrahat station to sell it to local collectors. Primary data reveals that almost 70% of the total e-wastes hawkers of Kolkata are Magrahat based.



a. Collection of e-wastes on the platform of Magrahat railway station on Thursday e-waste haat (source-fieldwork)

The primary collectors sell the goods to the "secondary collectors" or bulk kawadiwalas of Chandni Chowk, from where the hawkers of Magrahat buy e-wastes. Often the "Delhiwalas", the mammoth collectors of e-wastes collect the goods and send it to Delhi by Road. Often hawkers take interest free "dadon" or loan from primary collectors to collect e-wastes. Exploratory survey shows that open dismantling of computers and its peripherals with screwdrivers and hammer is a common sight on the railway platform in Magrahat. The collected e-wastes are then piled up in the recycling yards beside the Magrahat station. In Sangrampur village of Magrahat I, the collected e-wastes are often dumped on the courtyards of residential houses where women are found busy in their household works or children play with these toxic hi-tech goods.

- **DISMANTLING**

The collected e-wastes are dismantled by open hands with primitive equipments like hammer or chisels. The circuit boards are broken down into small pieces and then separated and sorted. Women and children are employed in this sector specially for stripping off wires to extract copper. They use knife or blade. Similar scenario can be found in Tekpanja village of Magrahat I. Dismantling of mobile phones is a very common sight at Magrahat station road. Workers extract integrated circuits (ICs) from printed circuit boards (PCBs). They do not have any formal training. Plastic cases and batteries are kept separately for recycling. Batteries of mobile phones are sent to Chandni Chowk from where they are sent to Delhi or Moradabad for recycling. A primary collector of Sangrampur told that,as the electronic market is flourishing and new models of mobile phones are  being introduced rapidly, there is a simultaneous increase in e-waste volume.

Field study reveals that workers are aware of the toxicity of e-wastes. They know that e-wastes contain lead, mercury and polychlorinated biphenyls or PCBs and have adverse effect on their health and environment if not handled properly. Inhaling or handling such substances and being in contact with them on a regular basis can

damage the brain, nervous system, lungs, kidneys and the reproductive system (Pandve, 2007). They do not use gloves or masks. They told that they are too poor to buy gloves or masks. None of the respondents heard about Extended Producers Responsibility (EPR) or the E-Waste (Management) Rules, 2016.

Dismantling also takes place at the paddy fields. Fieldwork revealed that in the ground floor of a pucca two-storied house in Sangrampur, workers were busy to separate small circuit boxes. The place was not well ventilated or even well lighted. Just beside them, there was a pile of PC plastic boxes. When asked about the destiny of those boxes, they disclosed that those were to be taken by dealers of Sangrampur for melting and recycling.



2. Workers of informal economy are working in a scrap yard at Sangrampur (source-fieldwork)

- **RECYCLING, REFURBISHING AND REUSE**

By visiting the weekly e-waste haat in Magrahat station road it was revealed that the local people often buy second hand mobile phones from the primary collector. The primary collector segregated the collected mobile phones or any e-waste into two groups- the reusable and the non-reusable. Reusable goods are sold in the local market by agents or one can directly purchase it from the primary collector. Non–reusable goods are transferred to the scrapyards for dismantling. Often parts of the e-wastes like LCD screen of a mobile phone or SMPS are sold out separately at a very cheap rate. For example a standard first hand LCD costs rupees 300-600 but at Magrahat you can get the same second hand display for rupees 100-150 only.

Sangrampur village may be called as "e-waste village" as almost every household of this village is engaged in the business of e-waste recycling. On the way of Tekpanja village a recycling unit was visited to see how the workers were busy to convert CRT monitors of PCs into television monitors. The local term of converting the CRT monitor of a PC into Television monitor is "Boff." The 'boffed' TV is sold for rupees 1600-2000 in the local market. It was found that children were also engaged in this work. The plastic casing of PCs are often sent to Chandni Chowk,

Kolkata from where it is sent to Topsia for shredding or to make plastic granules. The granules are then used to make low-end market based plastic sheet or strap of hawaii sandals or household appliances in Tangra (Bibir Bagan, Baishali and Seal Lane) or Topsia, Kolkata. The functional parts of PCs are used to make assembled computers (mainly in Chandni Chowk).

Open burning of wire is practiced in this two Blocks to recover copper. Exploratory survey in Tekpanja found that the ash contents of plastic wire is washed out in two local ponds to extract melted copper thus polluting and contaminating the water. The survey could not found any acid bath method of PCBs for recovering precious metals like gold or silver from e-wastes.

The average working hour is 80-10 per day for which workers earned rupees 200-250. Discarded televisions are brought into Tekpanja mainly for repair and reuse. If the TV set is nonfunctional then they dismantle it to recover copper from TV yolk. The CRT glasses of televisions are not recycled here and therefore scattered here and there.



**3.**Conversion of PC- CRT monitors into Television monitors by "boffing" (source-fieldwork

Following facts have been found from workers of Magrahat involved in informal e-waste management-

- Out of the 30 respondents only 2 people have their own units.
- All of the respondents know that these scrap contain hazardous constituents
- Everybody denied about any health problem out of their work
- Working hour- 10-12 hrs.
- Nobody heard about IPR or EPR
- Most of the respondent's family members including women and children (23 out of 30) are engaged in the same job.
- The equipments used by them were screw-driver, hammer and pliers
- Working with open hand

## VI.    CONCLUSIONS

Kolkata has become a major generator of e-waste in India. The city along with its suburbs are bocoming major hubs

for e-waste recycling. Study found that 95% of Kolkata generated e-wastes are managed by informal economy. Thus, Informal economy plays an important role in management of Kolkata generated e-waste and beats the recycling of formal sector in terms of collection, wage rate, transportation, segregation and recycling. Magrahat I and Magrahat II which are two CD blocks in Diamond Harbour subdivisions of south 24 Parganas are transformed to recycling hubs for Kolkata generated e-wastes. The informal economy of this area is producing

some low-end products like 'boffed' TV or plastic sheet etc. A large number of household of Magrahat are involved in this sector. The informal workers of these places use primitive methods to recycle or to extract metals from the e-waste, which can bring great damage to their health and local environment. The recycling of Kolkata generated e-waste in these two blocks represent a small segment of a flourishing informal industry which will further develop in mammoth size if we do not reduce the volume of e-waste generation of Kolkata.

**APPENDIX-1**

## Flowchart of Kolkata Generated E-Wastes and Their Way to Magrahat
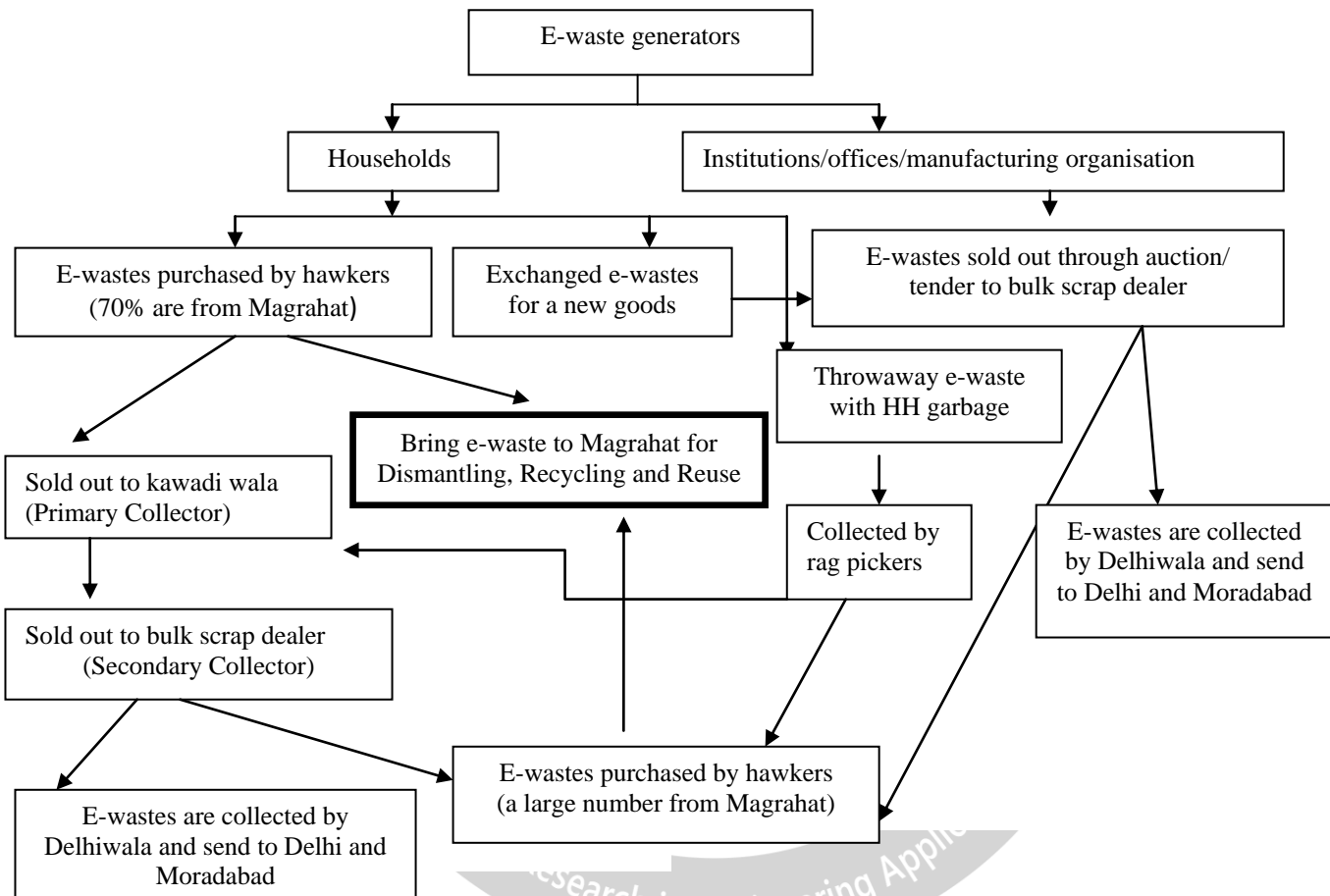
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