

## Management of informal e-waste recycling with special

### Reference to India

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### Abstract

Informal recycling is an upcoming minimal effort recycling practice in overseeing Waste Electrical and Electronic Equipment (WEEE or e-waste). The development of informal recycling of e-waste happens in developing nations like India where there is popularity for second-hand electronic machines and the practice of offering e-waste to individual gatherers. This paper assembles data on casual e-waste recycling in India and also abroad and spreading the familiarity with utilizing the right strategy for recycling in the informal segment. Apart from natural and health concerns, casual e-waste recycling also raises concern of the protection of recycled electronic items. This sort of recycling also affects the running of formal recyclers. Restricting or contending with the informal gatherers and recyclers is not a successful arrangement. New formal e-waste recycling frameworks ought to come into structure and take up the current informal parts and more approaches need to be made to enhance recycling rates, working conditions and the productivity of included informal players. This study focuses on management of informal e-waste recycling and how to diminish improper recycling exercises by creating awareness in the informal division.

### Introduction

Life seems impossible without electronic devices and our growing dependence on them makes them increase multifold. In India alone 0.4 million computers in 1992 have grown 100 times by 2010. Mobile phones have grown from 630 million to 1.2 billion in 2014. In next 10 years the number of T.Vs would be doubled while refrigerators would be thrice. Where do these devices end up when their lives end? The answer is E-WASTE. In 2005 e-waste in India was 1 lakhs 46 thousand tones per year and reached 5 lakh tones in 2010 and has grown 1 million tones in 2012. 500 percentage growth is estimated in next 10 years and only 11 percent of total e-waste is recycled.

The electronic goods market is dominated by the urban areas with 65 per cent and the remaining 35 percent by the rural areas. Television and electrical equipment contributes to 75 per cent of e-waste followed by 20 per cent by computers, two per cent by mobile phones and three per cent by others. Government, public and private industries contributes 70 percent of e-waste and remaining 30 percent is contributed by households and manufacturing industries. E-waste mainly comprises iron and steel amounting to 50 per cent, plastics 21 per cent, non-ferrous metals 13 per cent and other constituents 16 per cent. There are around 72 formal e-waste recycling units in India with a capacity of recycling 1.75 lakh tonne per annum.<sup>i</sup>

In India there are only 16 CPCB (Central Pollution Control Board) registered dismantlers or recyclers for the safe disposal of electronic waste. Out of these 16 registered dismantlers or recyclers, five of them are

in Karnataka, three each in Tamil Nadu and Maharashtra, and one each in Andhra Pradesh, Haryana, Rajasthan, Uttar Pradesh and Uttrakhand. The units handling and engaged in activities like collection, segregation, dismantling and recycling of e-wastes are required to register with the Central Pollution Control Board (CPCB) as per a directive of Department of Information Technology under the Ministry of Communication & IT, Government of India.<sup>ii</sup>

## Literature Review

**Dr. Ashish Chaturvedi, Dr. Rachna Arora & Ms. Sharon Ahmed**, “Mainstreaming the Informal Sector in E-Waste Management”. This study talks about the existing system in informal sector and its health implications. This paper also talks about the socio-economic implications and the activities integrating informal and formal recycling.

**Dr. Lakshmi Raghupathy, Dr. Ashish Chaturvedi, Dr. Rachna Arora and Vinnie Mehta, (2010)** “E-waste recycling in India: Bridging the formal-informal gap”. This study reveals that only 19000 tonnes of e-waste is recycled because of strong renovation market in India and ninety five percent is recycled by the informal sector. This paper concludes that the integration of formal and informal is essential in establishing a viable model for e-waste recycling.

**Xinwen Chi , Martin Streicher-Porte , Mark Y.L. Wang , Markus A. Reuter, (2010)** “Informal electronic waste recycling: A sector review with special focus on China”. This paper focuses more on encouraging informal e-waste recycling by implementing supportive policy under this sector resulting in thousands of job opportunities for low skilled workers in China.

## Statement of the problem

Informal e-waste recycling is very diverse in nature, henceforth it should be managed effectively and efficiently. Since informal e-waste recycling generates employment, it is important not to eliminate them but try to focus on reducing the improper practice carried out in this sector. Hence in this study an attempt has been made to give suggestions on how to diminish informal e-waste recycling.

## Objectives

- To study the e-waste practices carried out in India and China
- How to manage informal e-waste recycling
- To suggest to trim down informal practices carried out in India

## Research Methodology

As this is an exploratory study, the data is collected from journals, newspapers, websites and videos.

## What is E-Waste?

"Electronic waste" may be defined as discarded computers, office electronic equipment, entertainment device electronics, mobile phones, television sets, and refrigerators. This includes used electronics which are destined for reuse, resale, salvage, recycling, or disposal. Others are re-usables (working and repairable electronics) and secondary scrap (copper, steel, plastic, etc.) to be "commodities", and reserve the term "waste" for residue or material which is dumped by the buyer rather than recycled, including residue from reuse and recycling operations. Cathode ray tubes (CRTs) are considered one of the hardest types to recycle.<sup>iii</sup>

## Processing of e-waste

The genuine recycling includes dismantling of the item and the evacuation of a wide range of e-waste parts, some of which that contains risky substances that ought not simply end up in a landfill. Plastics should be separated, CRT should be removed, non ferrous and ferrous metals should be segregated and circuit board should be removed. Precious metals like gold, lead and copper can be recovered using various chemical process.

### •Plastic

All plastics are sent to a recycler who utilizes the crude material to make things, for example, vineyard stakes, wall posts and plastic sleepers.

### •Metal

Scrap metals are sent to a recycler. They are set through a shredder before attractive frameworks separate the ferrous from the non ferrous materials. The ensuing item is utilized as a part of the assembling of new steel and other metal items.

### •Glass

Cathode Ray Tube (CRT) glass, utilized in machine screens and TVs, are a real issue on the grounds that they consolidate numerous risky materials. To acquire the highest environmental result, the glass is send to CRT Recycling Centres where it will be processed before being utilized as a part in the manufacture of new CRT screens and TVs.

### •Mercury

Mercury is usually found inside numerous e-waste things and with the help of latest technology, it captures the mercury for use in dental amalgams.

### •Wood

Normally found in more seasoned TVs, stereos and speakers, wood is sent to recycling organizations that either shred it for utilization as mulch or use imaginative engineering to blend it with other waste materials for utilization as an option fuel source.

- Printed Circuit Boards

Circuit sheets are sent to ISO 14001 (Environmental Management) certified organizations. Here they can be handled in specific smelters to recoup non renewable assets, for example, copper, gold, silver, palladium and different valuable metals.

- Hard Drives

Hard drives, in entire and destroyed structure, are sent to an aluminum foundry for preparing into aluminum ingots. The larger part of aluminum ingots are utilized inside the car business.

- Toner and Ink Cartridges

Toner and Ink cartridges are bundled in a fixed box and returned back to industry recyclers. Some will be remanufactured into new cartridges, and the rest of can't be remanufactured will be divided into plastic and metal and returned back to the recycle chain as raw materials.

- Batteries

Nickel Cadmium, Nickel Metal Hydride & Lithium Ion batteries are sent, under recycling accomplices exceptional fare license, to SNAM (Société Nouvelle D'affinage Des Métaux) a French based organization who meets the European Union's strict natural models. The material is hulled to evacuate abundance plastic, and after that the metals put in exceptional smelter pots to recuperate cobalt, cadmium, nickel and steel for reuse in a scope of zones, for example, battery generation and stainless steel manufacture.

- CD ROMs, Sound & Memory cards

For copyright and security reasons these items are destroyed before being sent to plastic and metal recyclers

## **Informal e-waste recycling**

Ninety percent of India's e-waste is handled by the unorganised segment, embodying little sweatshops in urban slums. These units use perilous techniques - spilling corrosive over circuit sheets, case in point - to concentrate profitable components, for example, iron, gold, silver and copper. These unscientific routines creates health issues. Also, the unusable garbage is disposed of, resulting in environmental damage.

The organised sector utilizes technology to process e-waste in a safe and ecologically agreeable way. 95 percent of the electronic waste is changed over into reusable material like plastic, copper, aluminum, iron, and so forth. Attero Recycling in Noida states that they dig out 12 components from the garbage offering it to organizations and sellers and the balance five percent unsafe waste goes to government-sanction treatment, stockpiling and disposal facilities.

## Process of e-waste recycling in India by the formal sector

There are 64 approved recyclers, including Attero, E-Parisaraa and Ramky Enviro Engineers. Most have tie-ups with vast organizations to process their e-waste.

Attero's recycling methodology is a harmony between dismantling, mechanical detachment of complex materials and metallurgical treatment, bringing about a minimization in the labour work.

\* First Stage - Manual segregation of components, where different parts of E-waste are separated.

\* Second Stage - The mechanical separation process is applied. In this process, ferrous, aluminum, plastic and non ferrous materials are initially separated.

\* Third Stage - The plastics are then recycled by Attero Group's innovative plastics recycling process which further processes the plastic.

\* Fourth Stage - The non-ferrous metals are sent to Attero's metallurgical treatment plant where the non-ferrous metals are separated into constituent metals. This allows Attero Recycling to achieve higher efficiency and exceed recycling and recovery rates across the different WEEE categories. This is an indigenously developed process by Attero, a pioneer in transforming non-recyclable plastic to carbon black.<sup>iv</sup>

## Process of informal e-waste recycling in India

Ninety percent of e-waste is recycled by informal sector. E-waste is not accumulating in public areas nor are trash cans overflowing with old lap tops and cell phones in India. The informal sector goes from house to house to collect the used goods that are no longer being used, extract what it wants from them before burning them or destroying them.

Informal recyclers are usually children and they come from families with age-old traditions of recycling. The problem is that there is no proper handling of electronics and they just open however they can and extract what they want. No sophisticated machinery or personal protective equipment is used for the extraction of different materials. All the work is done by bare hands and only with the help of hammers and screwdrivers. Waste components which does not have any resale or reuse value are openly burnt or disposed off in open dumps. And they have no education regarding how to handle the harsh chemicals that are later released into the environment and water-sources. Cathode ray tubes' (CRTs) are broken down manually to separate its components such as glass, metal and copper. The glass, comprising lead, is sold to bakeries or bangle makers. Circuit boards have gold-plated brass pins, microchips and condensers. These components are heated and the fumes released during heating are toxic. Gold-plated brass pins are soaked in acid to recover the gold and brass separately. Microchips and condensers are heated in big containers filled with acid to extract metallic parts. This requires minimal capital investment which includes the cost of e-scrap, bribes to transfer it across state borders.<sup>v</sup>

## Process of informal e-waste recycling in China

In China there is a formal and a strong informal collecting system. The informal collection system called "cherry picking" utilizes only recyclable appliances and sells the reusable pieces to the local second-hand market. World's biggest dumping ground for electronic waste is China. E-waste arrives by a truck load to a south eastern village in China called Guiyu where locals are experts of ripping apart electronic trash. There are e-waste disposal businesses here on nearly every street. They rip apart the appliances and components for resale to future manufacturers. They work fast identifying and sorting plastics with the help of flames. All trash is foreign even though Chinese law has banned the import of e-waste. The most valuable electronic guts like circuit boards are separated and the rest are treated like giant plastic harvest. Workers take piles of plastic chip and mix them in water. This plastic will be then resold to a company which makes parts for Apples iPhone.<sup>vi</sup>

## Remedial Approach

From both the countries, we can see that there is no improvement or proper management of e-waste recycling in the informal sector. It is vital that informal recyclers are incorporated in any long term e-waste management strategy. The enactment covers the part of formal recyclers however fails to offer an unequivocal structure on how purchasers ought to go about discarding e-waste, and it is unlikely to anticipate that Indian gadgets merchants will stay informed concerning who purchased what and when. Instead of wiping out informal recyclers from the methodology and taking away from their livelihoods, informal recyclers can keep gathering the utilized waste things and offer them to formal recycling centres, permitting the formal recyclers to recycle them fittingly. There ought to be more number of organised players taking care of e-waste in order to evade old fashioned routines embraced by unorganised segment. E-waste can be collected from numerous points across the State and brought in fully covered vehicles to the centre and then transported to a recycling facility. Used computers can be given to schools for the benefit of poor students.

Awareness must be spread among consumers through various media and channels. Proper training can be given to the people in the informal sector handling e-waste and provide employment opportunities so that standard of living can be increased leading to a better and safe environment.<sup>vii</sup>

E-waste is a generally new portion in the worldwide issue of waste evacuation. It is additionally the quickest developing section worldwide in tossed waste. This issue on the planet is generally overlooked or misconstrued. Numerous individuals don't comprehend what it is or how it influences them, the world, or nature. So the inquiry "What is e-waste" needs to be tended to before any answers can be helpful. E-waste originates from the inappropriate transfer of any number of electronic gadgets. These gadgets incorporate machines, TVs, mobile phones, or most other electronic gear. Customers in developed countries are fast to reinstate their gadgets in light of persistent mechanical advances. This updating prompts an overabundance of unused electronic gadgets. What is finished with old machines and telephones is what is helping the e-waste issue. Some individuals comprehend the criticalness of

legitimately discarding these old units, yet numerous all the more still toss them in the trash or incinerators.

Most of the countries on the planet have laws and regulations obliging that e-waste not be discarded in landfills or be burned. Urban areas and states have set up projects over the United States where buyers can drop off utilized electronic gadgets to be legitimately discarded. The best system for transfer is to reuse these supplies. Numerous individuals don't comprehend that the parts in old gadgets can be reused in new items. There is a well known mantra utilized by numerous reusing promoters, "Reduce, Reuse, and Recycle." This trademark has generally been advanced with plastics and glass, yet its message is additionally material to the transfer of e-waste. Numerous electronic stores offer administrations to help clients get old hardware or parts in order to discard them securely and legitimately.

Lamentably, there is an alternate option being utilized for the evacuation of e-waste on the planet. A great part of the e-waste in developing countries is being traded to developed nations. Numerous developed nations have ordered laws to keep this from happening, yet e-waste is still frequently being exported. The main part of the world's e-waste is being sent to Nigeria, Ghana, Pakistan, India, and China, among others. While it appears odd that a nation would eagerly import an alternate's waste, the waste is foreign made, now and then unlawfully. This practice gives occupations and important scraps. E-waste is a wellspring of profitable metals, for example, gold, nickel, copper, iron, and silicon. The nations that are accepting this e-waste have remiss laws ensuring their specialists or nature. A considerable lot of the specialists are kids, or are working incalculable hours every day. There is likewise the truth that a great part of the decline from electronic gadgets is unsafe. The dumping of these materials emulating the collecting of scrap can prompt defilement of soil or water, harming a range's surroundings and possibly their sustenance sources.

## References

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