

## A Most Recent Comprehensive Study of E-Waste Management Practices & Process and Some Recommendations in Prospect of Bangladesh

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**Abstract:** "E-waste" is a popular, informal name for electronic products nearing the end of their useful life. E-wastes are considered dangerous, as certain components of some electronic products contain materials that are hazardous, depending on their condition and density. The growth of e-waste has significant economic and social impacts. The increase of electrical and electronic products, consumption rates and higher obsolescence rate leads to higher generation of e-waste. Hazardous and toxic materials from e-wastes and scrap recycling business are polluting the air, soils and water ways and also a threat to human health. Discarded computers, televisions, stereos, copiers, fax machines, electric lamps, cell phones, audio equipment and batteries if improperly disposed can leach lead and other substances into soil and groundwater. Many of these products can be reused, refurbished, or recycled in an environmentally sound manner so that they are less harmful to the ecosystem. At present, there is a lack of awareness about the hazards of electronic waste (or e-waste) and the ineffective management of the country's e-waste has gained significant attention in Bangladesh. Do we know what happens when we throw out our old electronic devices? Probably not, this paper highlights the hazards of e-wastes, the need for its appropriate management and options that can be implemented.

**Keywords:** e-waste, Bangladesh, Electrical equipment, UNDP, UNEP, MoEF.

### 1 Introduction

Industrial revolution followed by the advances in information technology during the last century has radically changed people's lifestyle. The technical skill acquired during the last century has posed a new challenge in the management of wastes. Like other countries in the Asian region, Bangladesh has adopted information and communications technologies (ICTs) as tools for development. The government of Bangladesh currently has a declaration on building a "Digital Bangladesh" by 2021. In recent years, as a result of increasing access to technology and the rapid growth of the Bangladesh economy, a market has emerged for computers, consumer electronics and home appliances. This emerging market has seen an increase in the amount of local consumer electronics products in the market and as a result and increase in the level of equipment that is being disposed of. In Bangladesh, this electronic waste is reused, broken down for parts or thrown out completely. Currently

this informal practice is not being carried out safely and has become a danger to human health and the surrounding environment. At present there is a lack of awareness about the issue in the general population, in the Government and also in private companies. This research report has been written based on primary data as well as based on the secondary sources of information. This report will give an idea of present situation analysis, gaps and recommendations for way forward.

## 1.1 Objective of the study

The purpose of this study is to

- ✓ Identify the total volume of e-waste that has been generated in Bangladesh till now.
- ✓ Provide a complete framework for the management system of dumping of e- waste.
- ✓ Determine how to stop e-waste generation through policy and law.
- ✓ Assist the government, private sector, learning institutions and stakeholders to handle and manage electrical and electronic waste effectively to enhance environmental conservation.
- ✓ Educate the general populace about the hazards of e-waste.

## 2 E-waste status in Bangladesh

No inventory has been made to assess the extent of the e-waste problem in Bangladesh. The goods below all contribute to the volume of e-waste in Bangladesh. The total number of PCs, TVs and refrigerators purchased in the year 2006 was 600,000, 1,252,000 and 2,200,000 respectively. At year end 2008, the total number of TVs in use in Bangladesh was roughly 10.3 million. Every year around 5,985,000 TV sets become scrap and this equates to approximately 88,357 metric tons of e-waste. The total number of active mobile phone subscribers in Bangladesh was 58,360,000 at the end of May 2010. Each year more than 2.8 million tons of electronic waste (including e-waste from 'ship breaking yards') is generated in Bangladesh. E-waste generated from ship breaking yards is equivalent to approximately 2.5 million metric tons per year. Persistent Organic Pollutant (POPs) that are generated from ship breaking sites: PCB, Dioxin, Furan. 10,504 metric tons of e-waste has been generated from mobile phones within the last 21 years. Within the last 10 years, the IT sector has generated approximately 35,000 metric tons of e-waste in Bangladesh. We can presume on the basis of the number of subscribers in Bangladesh that there are more than 50 million mobile phone handsets in use in our country. The average longevity of a non branded handset is about one year, whereas a branded mobile handset is expected to last from 2 – 3 years. If non-branded mobile phones account for 60% of the market, therefore every year we can assume we are disposing of over 10 million mobile phones. The mobile service providers in Bangladesh expect to have 100 million subscribers by the end of this decade. Thus very soon we could expect to be disposing of approximately 25 million mobile phones annually.

### 2.1 E-waste concentration areas:

In Dhaka, the areas with the most concentrated disposal and storage of e-waste are in Islampur, Kamrangirchar, Gingira, Mirpur and Mohammadpur.

## 2.2 Brief Findings:

Deriving data from all sources, we estimate that e-waste generated in Bangladesh each year can be summarized like this;

Ship Breaking Yards	= 2.5 MM ton/yr (250000 metric ton/yr)
Television Sets	= 0.17 MM ton/yr (26000 metric ton/yr)
Computers	= 0.035 MM ton/yr (35000 metric ton/10yrs)
Mobile Phones	= 0.005 MM ton/yr (10504 metric ton/21yrs)
CFL Bulbs	= 0.0005 MM ton/yr (566.90 metric ton/6yrs)
Mercury Bulbs	= 0.001 MM ton/yr (1861.32 metric ton/10yrs)
Thermometers	= 0.009 MM ton/yr (8513.59 metric ton/10yrs)
Other Waste	= 0.09 MM ton/yrs (93478.25 metric ton/10yrs)

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Total = 2.81 million metric tons/yr

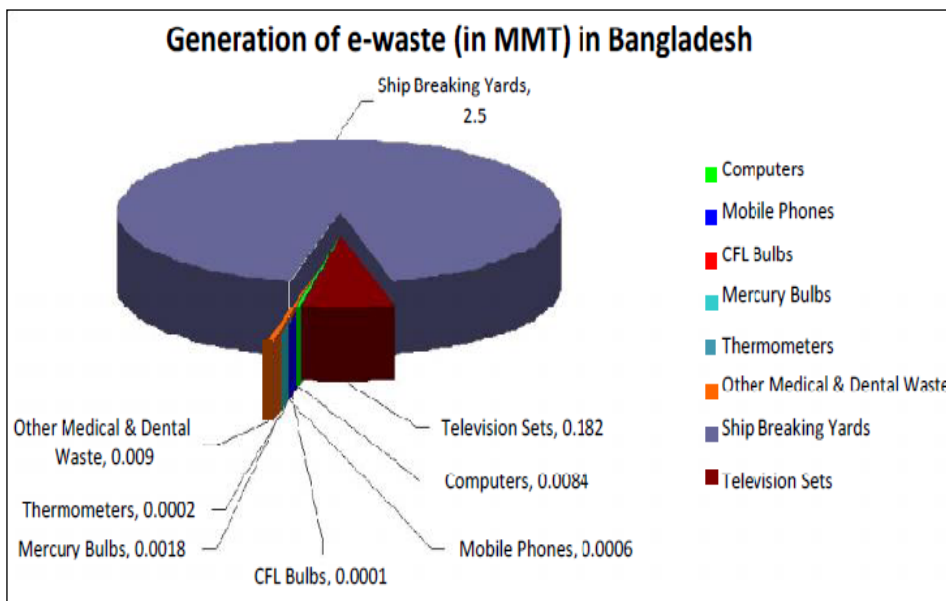


Figure-1: Graphical presentation of E-waste scenario (MMT/year) of Bangladesh

## 3 Impacts of E-Waste:

Every year Bangladesh generates roughly 2.8 million metric tons of e-waste. When the earlier mentioned heavy metals and trash electronic items are disposed without understanding the harmful effects of dumping this waste in to open landfills, farming land and open bodies of water, the hazardous compounds get released which affects human health and the environment adversely. Components which are not biodegradable or cannot be recycled are dumped or burned in open those release toxic substance into the environment. The

ecological, economic and social consequences resulting from poor handling and management of e-waste include:

### 3.1 *Health consequences*

- Breathing cadmium can severely damage the lungs and cause death.
- Lead attacks the nervous system in both adults and children.
- Inhaling the hexavalent form of chromium can damage the liver, kidneys, cause lung cancer and asthmatic bronchitis.
- Chromium easily passes through cell membranes and can cause damage to DNA,
- Mercury can cause brain and kidney damage and is also harmful to the developing fetus because it can pass through breast milk
- Cadmium causes cancer and can damage the bones and kidneys, where it accumulates

### 3.2 *Environmental consequences*

- Air pollution from burning of e-waste
- Management problem of non-biodegradable equipment
- Toxic and radioactive nature of e-waste to the human, plants and animals
- Blockage of water runoff channels
- Increased amount of waste
- Waste disposal problem

### 3.3 *Economic consequences*

- Substantial public expenditure on health care
- Investments in complex and expensive environment remediation technologies
- Misuse of resources that can be recycled for re-use
- Opportunities for recycling industries and employment
- Ozone layer depletion which led to unpredictable weather conditions i.e. prolonged droughts and floods demand the use of resources which should be deployed for growth and development in other sectors

### 3.4 *Social consequences*

- E-waste affects human health (e.g. lead poisoning and cancerous mercury)
- Growth of informal waste disposal centers in the locality
- Illegal trade and informal management of e-waste
- Loss of appreciation for ICT

In Bangladesh every year more than 15% of child workers die as a result of e-waste recycling and more than 83% are exposed by toxic substances and become sick and are forced to live with long term illness.

## 4 Recycling and disposal of E-waste:

Bangladesh is developing with the increasing of technology usage. Sustainable and safe use of technology can drive an economically developed country. But the wastes from these electronic goods come to us as curse. We consume and dump the useless products without any consideration of environmental benefits and sustainability. These lead us to the contamination due to the heavy metals and other hazardous chemicals.

Best management practice of e-waste in developing countries in the world includes Collection and Segregation, Product Reuse and Disposal, while, in developed countries it covers remarketing, reuse and recycling of e-waste.

**Collection:** The proper collection of wastes is the prerequisite for management of e-Waste. The source of e-Waste varies from household to offices and businesses and the waste composition differs depending on its source of generation.

**Dismantling:** The segregation and dismantling of e-Wastes is also performed by the informal sector in countries like Bangladesh, India, Pakistan, Afghanistan, China, Thailand and Vietnam for commercial as well as residential e-wastes. In Malaysia currently the commercial e-Wastes is dismantled and separated into various parts and components for resale/recycle/recovery locally while the residential e-Wastes is discarded as garbage and disposed off in landfill.

**Reuse & Recovery:** Reuse and refurbishment of the components or equipments forms a common practice in the developing regions as it extends the useful life thus minimizing the generation of waste. The process like reuse, reassembling and repair of components is more valuable than using the precious metals as secondary raw materials.

**Disposal:** The recycling processes usually have low recycling rates as for the informal sector. The major thrust for recycling is precious material extraction due to which the other hazardous components are usually dumped in landfill and for the formal recycling units the efficiency is less as the collections targets are not met and lack of efficient technologies.

This study focuses the best management practice through the amalgamation of both developed and developing countries management practices. This is because Bangladesh is one of the hubs of e-waste generation countries. Bangladesh generates (2.8 MMT) approximately one tenth of total (20-30 MMT) waste generation in the world. Therefore, best practice management will be helpful to proper management of e-waste in Bangladesh. Environmentally sound E-waste treatment technology was identified at three levels. The first level included decontamination, dismantling and segregation. The second level included shredding and four special treatment processes like electromagnetic separation, eddy current separation, CRT breaking and treatment and density separation using water. The third level treatment included recovery of metals and disposal of hazardous E-waste fractions including plastics with flame retardants, CFCs, capacitors, Mercury, lead and other items.

The process of recycling in Bangladesh has the potential to be hazardous to the recycler's health. Currently, there are no proper waste management guidelines or regulations in place. Reuse of e-equipment is a common practice in Bangladesh. Equipment recycling and dismantling is a continually growing business, yet a formal recycling sector does not exist. All the recycling is being carried out by the informal sector. It is estimated that

120,000 urban poor from the informal sector are involved in the recycling trade chain in Dhaka city. 15% of the total waste generated in Dhaka (mainly inorganic) equates to 475 tons recycled daily. Of this amount, only 20% to 35% is recycled, while the remainder is disposed of in landfills, rivers, ponds, drains, lakes and open spaces.

## **5 Management Options of E-waste:**

It is estimated that 75% of electronic items are stored due to uncertainty of how to manage it. These electronic junks lie unattended in houses, offices, warehouses etc. and normally mixed with household wastes, which are finally disposed off at landfills. This necessitates implementable management measures. In industries management of e-waste should begin at the point of generation. This can be done by waste minimization techniques and by sustainable product design. Waste minimization in industries involves adopting: inventory management, production-process modification, volume reduction, recovery and reuse.

### **5.1 Recommendations**

All the stakeholders: producers, sellers, users, recycle, agencies and the policy makers must sit together to implement a sustainable solution to the problem of E-waste. The following recommendations can be forwarded for effective management of e-waste.

#### **5.1.1 Legislation**

Comprehensive and sustainable laws are needed to ensure hazard free recycling of e-waste, which will be based on “polluter pay” principle. Government should enact rules for e-waste Management and handling. The legislation should ensure environmental justice and involve the participation of all the stakeholders.

#### **5.1.2 Awareness Program**

A large-scale awareness program should be initiated for all the stakeholders: producers, sellers, users, recycle shop owners and workers to enhance their understanding regarding the danger of e-waste and also to ensure their participation in the recycling process.

#### **5.1.3 Developing the Infrastructure**

Collection infrastructures such as collection points, refurbishing and recycling centers should be established in urban and rural areas. Here government can play a leading role by providing incentives.

#### **5.1.4 Establish Recycling Plants**

There is urgent need to establish e-waste treat plant. This may be founded on public-private partnership (PPP/Non-profit basis). Producers should be registered with the recycling agencies and treatment plants for paying the recycling cost. Treatment cost might be shared by producers and consumers. It can also be based

on profit. But some control should be established as profit making opportunity might lead towards early recycling and inefficient utilization of resources.

### **5.1.5 Extended Producers Responsibility**

Producer's responsibility should be extended so that they will ensure that hazard free disposal of e-waste is ensured. They should be responsible for the products after their useful life and pay the cost to the recycling agency. This will encourage redesign of products aiming at improved recyclability, reduce the use of toxic materials by developing alternative materials, encourage producing products with longer life span and promote research and development of environment friendly technology.

### **5.1.6 Registration of producers**

Producer Responsibility Organization (PRO) should be established to make them more accountable.

### **5.1.7 Separation of Garbage**

In Bangladesh household wastes are not separated before disposal. Initiatives should be taken to separate garbage's into burnable, non-burnable and e-waste. This will help the households to segregate waste easily and isolate e-waste which will in turn increase recovery by reducing wastage.

### **5.1.8 Incentives**

Government should think of providing incentives for being environment friendly and encourage the use of cleaner material technology in recycling. Incentives in the form of tax exemption might be provided to the producers using toxic free materials.

## **6 Policy regime:**

- ❖ There are no specific laws or ordinances for e-waste management and recycling. But we have the Bangladesh Environment Conservation Act of 1995, the Environmental Court Act of 2000, and The Environmental Conservation Rules of 1997.
- ❖ Government already prepared draft National 3R (Reduce Reuse and Recycle) Strategy and in that draft e-waste issues were addressed.
- ❖ Medical Waste Management Rules, 2008 addresses the waste management issues for the medical sector including E-waste.
- ❖ The Department of Environment prepared draft solid waste management rules which is now in consultation stage and still time to include E-waste management issues in that rule.
- ❖ Hazardous Waste Management Rules is under preparation and still time to incorporate E-waste management issues for proper management of E-waste among others.
- ❖ The High Court of Bangladesh has directed the Department of Environment to ensure that all ship-breaking yards operating without environmental clearance shut down their operations.

- ❖ The High Court also directed the government to ensure that no ship with hazardous waste enter the country without being pre-cleaned at the source or outside the territory of Bangladesh.

## 7 Conclusion

While the problems of e-waste management are widely discussed, there should be an urgent need to conduct in-depth studies in Bangladesh. This is to help policymakers with appropriate policy instrument as well as to dispel common myths that e-waste is yet to be threat in Bangladesh. This study has explained the need to increase e-waste recycling. In Bangladesh, the quantity and process of recycling of e-waste is very rudimentary and is emerging as a huge threat. It is high time for the stakeholders to act now; however, further studies in related areas could assist in the overall goal of reducing electronic waste.

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