E-waste Management Industry, User Community and Circular Economies of Digital Technologies

Definition of E-waste

Electronic waste, or e-waste, refers to electronic products or equipment that have been thrown aways, are no longer functional, or have reached the end of their useful lives. Any device containing circuitry or electrical components with a power or battery source falls into this category. E-waste is one of the fastest-growing wastes developed in the world.

Why We Should Care about E-waste

- Electronics contain a variety of toxic substances, making e-waste very hazardous to human life and surrounding. If improperly disposed of, toxic components in these devices, such as mercury, lead, and cadmium might leak and contaminate the environment.
- Poor e-waste management is costly to both people and to environment. Many electronic wastes are mishandled exposing communities and the environment at dire risk because of its hazardous and wasteful design.
- Developed countries have been illegally exporting electronic waste to low-income or middleincome countries to dispose of them in landfills for years. The dangers of e-waste had a massive effect on the local people of the dumping site, especially, in terms of physical wellbeing.

E-waste Scenario in Bangladesh

In past few decades, Bangladesh has experienced a phenomenal increase in usage of electronic components, microchips, and automated machinery in household appliances, office equipment, transport systems, industrial tools and devices and so on. When these items reach the end of their lifecycle, they are thrown into waste streams and disposed of as municipal solid waste (MSW). Bangladesh produces 3 million metric ton (MMT) of e-waste, including ship-breaking yards, each year¹. Currently, the annual rate of e-waste production is surging at 30%. In Bangladesh, mobile/cell phones contribute the most to e-waste streams. Cell/ mobile phones alone contribute

¹ https://www.sciencedirect.com/science/article/pii/S2773032822000256

10.5 kgtons of e-waste, around 2,96,302 units of TV sets become trash and create 1.7 lakh tons of e-waste, and shipbreaking yards generate more than 25 lakh tons of e-waste each year. Unrecycled e-waste ends up in different landfills, water drains, and channels polluting the environment. In Dhaka, 475 T/day inorganic e-waste is recycled, only 15% of total e-waste generation/day.

The following pie chart depicts clear scenario of e-waste generated from different devices and equipment:



Figure 1: Proportion of e-waste generated per year by the category of electronic equipment

There are now around 130 million mobile users in Bangladesh, which was only 20 million in 2006². At the national level, 41,433,742 households have a mobile phone, 22,193,311 smart phone, 325,580 fixed telephone, 5,431,793 radio, 26,354,551 television, 41,435,264 telephone, 3,687,455 computer and 16,198,194 internet users³.

E-waste Management in Bangladesh

Reuse: The system of managing e-waste in Bangladesh is very disorderly. Here are multiple processes that are widely adopted, but among them, reuse practices frequently take place. It is

² https://cri.org.bd/publication/digital-revolution/Bangladesh's%20Digital%20Revolution.pdf

³ https://www.thedailystar.net/business/economy/news/only-87-households-have-computers-bbs-survey-3221966

estimated that more than 63.37% of e-waste in Dhaka is resold after the products have been repaired.

Recycling: The electrical and electronic waste are recycled to be turned into new materials that can be used again. Unfortunately, there is no standard recycling process across the nation. Particularly, in Chattogram and Dhaka, only 20% to 35% of all generated e-waste is recycled, and the rest is disposed of haphazardly, mostly burned generating huge amount of greenhouse gasses (GHG).

Dumping and Landfilling: The common manner to dispose of computers, mobile phones and other digital devices is throwing them in litter bins. Medical e-waste is mainly disposed of in offices, with the rest going to dumpster, accumulators and mostly burned or extracted in small pieces afterwards by the informal waste-collectors/ vendors. Crude open dumping of waste is a widespread practice for landfilling which is applicable for e-waste as well. Incineration technology is very new to Bangladesh and has been installed lately in Aminbazar landfill⁴ aiming at producing energy from waste, an idea taken from many developed countries. While the developed countries implement inceneration projects with special care and consideration of the environment and people, Aminbazar initiative has quationable viability clearances in terms of measuring future environmental impact on the surrounding community in coming days.

Additionally, there are some more flawed practices observed at e-waste sites including:

- scavenging
- dumping on land or in water bodies
- landfilling along with regular waste
- opening burning or heating
- acid baths or acid leaching
- stripping and shredding plastic coatings
- manual disassembly of equipment

⁴ https://www.thedailystar.net/news/bangladesh/news/govt-set-waste-energy-plant-aminbazar-landfill-3457156

E-waste Recycling Companies in Bangladesh

E-waste recycling companies in Bangladesh have potential to make a significant impact on the environment and can contribute to the economical growth at the same time. There are a couple of companies in the country that are working on e-waste recycling in a safe and environment-friendly manner are called formal recycler. Top 5 formal E-Waste Management and Recycling Companies in Bangladesh are:

- JR Enterprise: JR Enterprise is a prominent degaussing facility in Bangladesh, which provides the most secure data destruction solution for any type of hard drive, data tape, and pen drive. This company has its own green truck facility that will collect e-waste from customers' doorsteps and dispose them off in such a way that it does not have any negative effect on the environment and soil. JR Enterprise encourages everyone to be aware of proper e-waste management and is committed to providing all necessary assistance in this regard.
- Azizu Recycling & E-Waste Company Limited: The factory has its own electrical substation, gas generators, deep-water pump, water reservoir, water treatment plant, latest machinery, and an expert workforce to ensure environmentally safe, optimum waste recycling. There are five separate units for e-waste recycling. All the units are now almost fully equipped with state-of-the-art environment-friendly machines.
- M/S. Zaman Enterprise: Apart from e-waste recycling, the company specializes in separating and segregating scrap, old, unused, and unserviceable telecom equipment like telecommunication transmission and distribution equipment, and exchanges both analog and digital.
- SGS Bangladesh Limited: SGS Bangladesh has a specialized e-waste management facility that is designed to process and dispose of e-waste in environmentally responsible manner. The SGS e-waste management facility in Bangladesh employs a range of technologies and methods for sorting, recycling, and disposing of e-waste materials. This includes mechanical separation, shredding, and smelting. The facility also has environmental controls in place to ensure that toxic materials contained in e-waste are not released into the environment.
- Yousuf Enterprise: This company has an expert team of professional IT remarketing and ewaste disposal technicians who are experts at secure e-waste solutions including data deletion,

IT asset management, and disposal services, in an environmentally sustainable manner. Yousuf Enterprise guarantees the highest security levels for its clients. The company holds full responsibility for customer assets, ensures data security, and operates with the highest standard of care.

In informal recycling, people take old devices and hand them over to be recycled. These include computers, monitors, televisions, and printers. However, these devices are not considered as recyclable materials because they do not have labels on them that indicates they should go in the recycling bin. The size of informal recyclers ranges from individual households to small groups. Informal recyclers may use their containers or temporary ones that they create themselves. Informal sectors control the recycling process in Bangladesh, and the ratio of recycling to the generation of e-waste is only 3% of total e-waste, which is much lower than in other developing countries⁵.

Affects of E-waste Management

The primary victims of e-waste exposure are children and women. Fifty thousand children are engaged in Bangladesh's unauthorized e-waste collection and recycling process⁶. The are highly exposed to e-waste-derived chemicals and waste from landfill sites. In informal setting, there is high risk in handling e-waste in recycling facilities since staff are unaware of the hazards of handling e-waste and have less practice of using personal protective equipment (PPE) to shield themselves. In these workplaces, Chemical Risk Analysis (CRA), Task Risk Analysis (TRA), or Health Risk Analysis (HRA) are not appropriately assessed.

However, there are some impacts of improper e-waste management listed below:

On Humans

Electronic waste contains toxic components (metal and chemicals) that are dangerous to human health. This includes Mercury, Lead, Polybrominated Flame Retardants, Cadmium, Barium, and Lithium. These toxins can damage skeletal, nervous, and reproductive systems of the human body which can lead to diseases and birth defects. Eventually, these effects can damage human blood, kidneys, central and peripheral nervous systems. On the other hand, e-waste affects increase rates

⁵https://www.sciencedirect.com/science/article/pii/S2773032822000256#:~:text=Informal%20sectors%20control%20the%20recycling,than%20in %20other%20developing%20countries.

⁶ https://www.sciencedirect.com/science/article/pii/S2773032822000256

of attention deficit or hyperactivity disorder (ADHD), behavioural problems, changes in child temperament, and sensory integration difficulties.

On Environment

Electronic waste contains toxic components (metals and chemicals) that are hazardous to the environment. This includes impacts on:

• Soil: E-waste that is disposed of in regular landfills pollutes the soil. When e-waste decomposes in the soil, harmful heavy metals such as lead and cadmium are released, contaminating crops and microorganisms.

• Water: E-waste also contaminates groundwater. Toxins in these wastes are harmful to animals, plants, and communities. It becomes difficult to find clean drinking water.

• Air: Improper e-waste shredding and melting releases dust particles such as dioxins, which pollute the air and harm respiratory health. Burning e-waste releases small particles that might cause cancer and chronic ailments⁷.

E-waste and its Relevance with Circular Economy

Circularity is the next big frontier for digital sustainability. In a circular economy, designers and manufacturers create products with the end of the products' lives in mind. That means keeping products in use for as long as possible and then recycling the materials that go into them to minimise or even eliminate waste. Digital sustainability means adopting technology that has environmental, societal and financial benefits. Circularity is making this improved technology possible. Growing awareness and action by technology companies and consumers are leading the world towards a circular economy that can combat e-waste through digital sustainability and it is high time for Bangladesh to be a part of it.

Two key solutions to the e-waste problem have emerged: moving from a linear to a circular economy, and fostering digital sustainability, including creating more efficient IT. Tech companies have stepped up to become part of the solution of e-waste disposal issues. For example, HP designs products to be durable and easily repaired so they can stay in use for as long as possible, while its service-based solutions reduce environmental impacts through extended life, device optimisation

⁷ https://going-e-green.webflow.io/posts/ewaste101

and product take-back. HP's repair, reuse and recycling services also help to recover products, components and materials for the next generation of products⁸.

Policies and Regulations in Bangladesh

In Bangladesh, e-waste was first identified as a potential source of harmful chemicals incorporated into the medical waste (MW) management guidelines. After 40 years of independence, Bangladesh amended the first draft of e-waste management regulations in 2011. The draft included different legislation, e.g., ship-breaking rules, environment conservation act, medical waste management rules, 3R approaches, and management regulations of solid and hazardous materials. Bangladesh Environment Conservation Act, 1995 was updated in 2021 with announcement of "Hazardous Waste Management Rules", and e-waste management was a significant part of it. However, the practical implementation of the legislation is not efficiently conducted, which hinders the proper establishment of e-waste management process in Bangladesh which is also effective for the overall waste management scenario in the country.

On a positive note, Governement bodies (i.e., City Corporations, Department of Environment, etc.) responsible for e-waste management, have already established some acts/ rules for appropriate e-waste management while and some other rules are still under discussion. The progress is presented in the following figure:

⁸ https://impact.economist.com/sustainability/circular-economies/a-circular-approach-to-tackling-e-waste



Figure 2: Progress of government's initiatives regarding e-waste management

Challenges in E-waste Management and Role of Stakeholders

The major challenges of e-waste treatment include safe collection, sorting, inhomogeneity of waste, low energy density, prevention of further waste, GHG emission, and determining cost-effective manners of recycling. Some other challenges are:

- Lack of funds and investment to finance profitable improvements in e-scrap/ e-waste recycling
- Absence of legislative implementation in Bangladesh, in both formal and informal e-waste disposals
- Absence of mandated or effective voluntary take-back programs (Extended producer responsibility, EPR) for end-of-life Electrical and Electronics Equipment (EEE) in developing countries

 Unwillingness of consumers and enterprises to hand out their obsolete EEE or pay for Waste from EEE (WEEE) recycling⁹

Stakeholders		Responsibilities
Management authorities	E-waste recycling Fund Management Center	Operation of the system
	State Council	Release of Regulation
	Authorities from local municipal level, provincial level, and state council level	Planning; Technical policy; Environmental inspection, etc;
Collectors	Retailer	Collection of the
	Professional collector	e-wastes and submit
	Repair shops	recyclers
Third party Service Provider	Logistics Providers	Transportation
	Quality Inspector	Environmental inspection
	IT service provider	IT service
Producers		Pay the e-waste recycling fee according to market share
Recyclers		Sorting; dismantling; treatment of e-waste
Waste disposers		Landfill or incineration of hazardous material & waste
Consumers		Submit (or sell) the e-waste to the qualified collectors

Different stakeholders and their major roles in e-waste management are given in the table below:

Figure 3: Responsibilities of e-waste management actors

The Way Forward

Only through concerted efforts of the government, organizations as well as individuals can solve the issues regarding e-waste or reduce it significantly. Various strategies have been highlighted and suggested by experts over years for tacling e-waste challenge with roadmaps of action. However, the government must provide support for most of these initiatives, such as by facilitating awareness

⁹ https://jrenterprise.com.bd/e-waste-management-in-bangladesh-challenges-and-strategie/

campaigns, establishing and monitoring legislations regarding the right to repair, EPR and manufacturers' accountability, and helping to build integrated waste facilities in major cities like Dhaka and Chattogram. On the other hand, manufacturers have dual roles: driving progress from their end and motivating consumers to join the cause. Initiatives like refundable deposit fees or advance disposal fees can nudge consumers towards responsible e-waste management by covering recycling costs. However, consumer responsibility is only possible when rigorous public awareness campaigns are held to spread messages regarding the dangers of e-waste.

In conclusion, addressing the challenges of e-waste management requires a multi-faceted approach that involves cooperation from various stakeholders. Only by adhering to the legislations and its practical implementation on-ground, Bangladesh can pave the way for a responsible e-waste management system that will contribute to environmental sustainability. By working together, the relevant actors can significantly reduce the environmental impact of e-waste and create a cleaner, healthier future for the country.