E-Waste and its impact

PRELUDE

Scene -1: Year 3022. The human kind has moved on to different space-ships for survival as the earth has become overly-polluted with garbage and destructions of plant and animal life, because of years of careless use of environment. The surviving humans have abandoned earth. Humans created special robots to clean earth so they can comeback on earth in near future. And also, they sent other robot on Earth to find existence of any kind of life on earth. The robots found that everywhere in the earth is covered by piles of garbage, wastes, metals, abandoned electronic products, toxic materials. And, most of these wastes are **e-wastes**.

Scene-2: Mr. Bakshi and his cyber security team are desperately looking for the reason behind the fact that money had been disappearing from huge numbers of customers' accounts, even when they didn't share any kind of personal or banking details. He was not able to track the pattern so that he and his team can catch the criminal. All of a sudden, one fine morning, he got an email from one of his old email ID conveying that someone has opened his email from another device. And in no time, he got notification that a huge amount of money had been disappeared from his own account. He tried to find out how anyone can open his email ID from other devices when the recovery mail ID is logged in on his brand-new mobile phone. And also, how can someone hack his bank account even when he never shared his personal and banking information to anybody. He neither got any fraudulent call from any spam number nor shared any kind of OTP to anybody. Then HOW? In search of all these questions, he started interrogating all the complainants once again and found out that all those account holders abandoned their old smart phones few days earlier to those money disappearing incidents. Hackers are illegally tracking our abandoned **e-wastes** to gather all personal information and then misusing in different ways.

These two scenes might have been from some movie for the time being, but this is an alarming situation and would affect human kind adversely in near future. The name of the problem is **e-waste**.

WHAT IS E-WASTE?

Image-1: Electronic waste at Agbogbloshie, Ghana.
Image credits: Muntaka Chasant.

Electronic Wastes or e-wastes are, in broad term, the electronic products that have been stopped working, and nearing or at the end of their "useful life" and had been abandoned by the users without taking those under any kind of recycling process. Electronic waste (or E-waste) is a broad term for any electrical and electronic equipment that is discarded. E-waste is increasingly emerging as a major environmental problem since it is so hard to recycle and it is so easy for toxic contaminants to leach into the soil and water.

GLOBAL E-WASTE GENERATION

Since 2010, the volume of e-waste generated globally has been steadily increased. By 2019, more or less 53.6 million metric tons of e-waste was generated, out of which about 44.4 million metric tons were generated in just last five years. Out of total generation of e-wastes, only 17.4 percent was documented to be collected and properly recycled.

Technological innovations and subsequent growing consumer demand have been the reason behind the fact that electronics have become a prominent part of the waste stream. The per capita generation of e-waste quantity was, however, the highest in Europe, with 15.6 kilograms per person, followed by Oceania at 15.2 kilograms per person and the Americas at 12.2 kilograms per person.
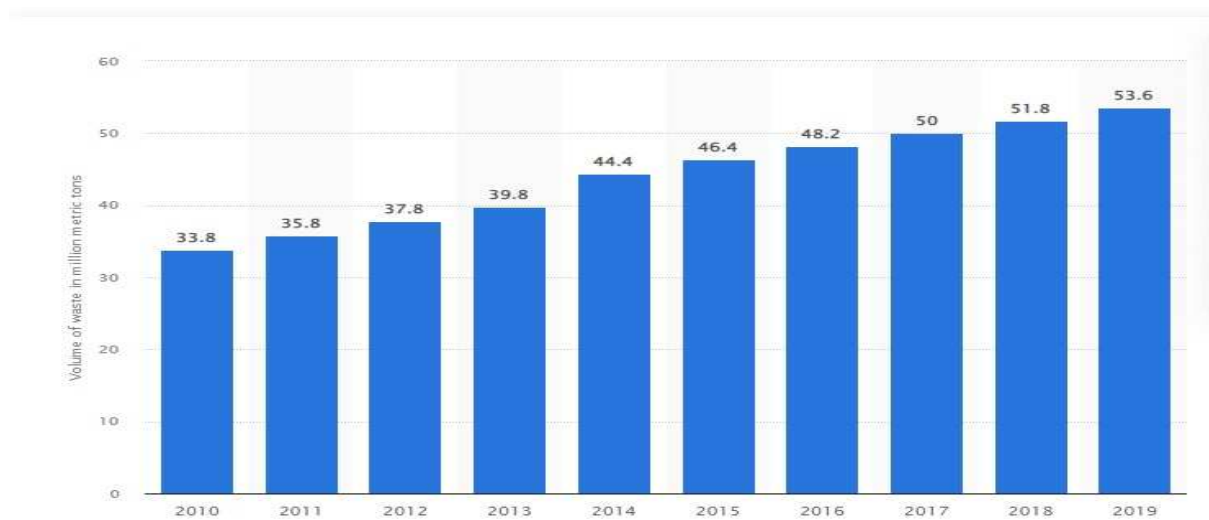

Image-2: Electronic waste generated worldwide from 2010 to 2019 (in million metric tons)
Source: https://www.statista.com/statistics/499891/projection-ewaste-generation-worldwide/

China, being the largest producer of electronic waste worldwide, generated more than 10 million metric tons wastes in 2019. The United States was the second largest producer of e-wastes with generation of about seven million metric tons. India has produced the third largest amount of e-waste after China and the United States. According to a Central Pollution Control Board report, in financial year 2019-2020, India generated about 1,014,961 metric tonnes of e-wastes.

As of 2019, the average global e-waste generated per capita stood at 7.3 kilograms, which is the largest volume recorded till 2019. Quantities of e-waste have been steadily increasing as people continue to discard old electronics, such as phones, laptops, televisions, fridges etc.

Image-3: An E-waste landfill in Ann Arbor, US. Image credits: George Hotelling.

MAGNITUDE OF THE PROBLEM

Generation of skyrocketing amount of e-waste is one of the rapidly growing and alarming problems of the world. E-wastes include multiple elements, some containing virulent substances that can be associated with adverse impact on human health and the environment if not handled properly by means of disposal or recycling.

In India, the main problem connected to e-waste management is not only the generation of its own e-waste but also dumping of e-waste from developed countries. And other problems lie with the nature of the substances - most prominently hazardous substances such as lead, polychlorinated biphenyls (PCBs), polybrominated biphenyls (PBBs), mercury, polybrominated biphenyl ethers (PBDEs), brominated flame retardants (BFRs), and other heavy metals such as iron, steel, copper, aluminum, cadmium, chromium and plastics. All these substances adversely impact human blood, kidney and the peripheral nervous system. When these are dumped in landfills, the chemicals leach poison in the ground water affecting both land and sea animals. Decomposition and recycling of e-waste is an expensive process and only a few developed countries can afford to do so. Enormous generation of e-waste has resurfaced in the discourse of climate change. According to the World Health Organization (WHO), health risks may occur from direct contact with virulent substances that leach from e-waste. Danger can come from inhalation of the virulent fumes, as well as from the accumulation of chemicals in soil, water, and food.

BEYOND THE ENVIRONMENT – DATA SECURITY

Image-4: Phones are not exempt from the problem, since increasingly, smartphones carry sensitive data. Image credits: Andrea Huyoff.

Now a days, smart phones and laptops have become the inseparable part of our daily life. We store thousands of data in our smart phones and laptops. Living in the era of online transaction, we put most of our personal data, like, identity, log in ID, password, credit card details, bank details which are connected to either our phone number or our email ID. And all these are being stored in the memory of smart phones or laptops. After a certain period of time, when the useful lifespan of these gadgets ends, these become e-wastes. If these e-wastes are not disposed or dismantled properly, the data inside the memory of those gadgets can be stolen and then misused illegally. Used electronics gadgets are an often-overlooked problem of cyber-security and we should pay more attention to the proper disposal of the gadgets as well as the data they still hold.

During the E-waste World Conference & Expo, John Shegerian (CEO of Electronic Recyclers International) called E-waste hacking "an overlooked crime" and "the greatest little secret of the cyber security world." Although official figures are lacking, cybercrime costs the world around $1 trillion per year or even more, and used electronics can be an important part of the problem.

The issue was also highlighted by a study from another researcher, namely, Josh Frantz who bought 85 used devices for $650, and tried to see what information he could retrieve from them. He found over 366,300 files, including images and documents, and was able to find personal details on multiple devices, including date of birth, social security numbers, credit card and passport numbers.

All in all, just 2 of these 85 devices had been properly wiped. The sample Frantz bought may not be representative of the entire industry, but it seems to be a large-scale problem. A similar experiment from 2012 found half of the devices analyzed still contained personal information that could be accessed. Yet another analysis from 2019 found that two-thirds of 200 USB drives sold on eBay still contained personal information. Similarly, security service provided Avast was able to retrieve data from discarded phones. Even though all the data had been removed from the devices, the data can be retrieved using commercially available software.

THE PANDEMIC MADE THINGS WORSE

Many things changed over the past pandemic years. Millions of workers, particularly those whose work involves a computer, found themselves working from their own home as part of the social distancing effort. In most of the cases, the home computer or laptop may not be as secure as the work computer. Furthermore, all these home computers are now storing company details in addition to our own personal details. Companies are more likely to pay attention to how properly those home gadgets are being disposed or dismantled.

WHY IS PROPER DISPOSAL OF E-WASTES A CHALLANGING ISSUE?

a) **Lack of infrastructure**: All e-waste is valuable as it is highly rich in metals such as copper, iron, tin, nickel, lead, zinc, silver, gold, and palladium. Printed Circuit Boards (PCBs) contain rare and precious metals such as ruthenium, rhodium, palladium, osmium, iridium and platinum – which are together referred to as the Platinum Group Metals (PGM). The rate of e-waste collection is very high in India owing to its valuable content. Unfortunately, the collection and recycling of e-waste is predominantly being done by the informal or unorganized and unskilled labour through highly environmentally degradative ways, which cause serious health hazards. Most of the cases, recovery rate of valuable materials ranges between 10–20% only.

b) **High cost of setting up recycling facilities**: Advanced recycling technology is expensive and makes large investments risky, especially when sourcing of e-waste is a challenge. Most of the formal recycling companies in India limit their role to only pre-processing of e-waste, wherein the crushed e-waste with precious metals is exported to smelting refineries outside India. An end-to-end solution for e-waste recycling is still not available in India.

Immense potential is there in augmenting e-waste recycling in the country. There are some forward movements in this direction, however, lots of ground has to be covered through awareness campaign, skill development, building human capital and introduction of technology while adopting adequate safety measures in the country's informal sector.

E-WASTE MANAGEMENT POLICY

This is high time to implement effective management of e-waste in India. MoEF & CC notified the E-waste (Management and Handling) Rules, 2011 which introduced EPR (Extended Producer Responsibility)– an important policy instrument currently used across the world to address the problem of e-waste. EPR entrusts producers with physical and financial responsibility for the post-consumer stage of a product in order to channelize e-waste to formal recyclers and to ensure environmentally sound management of the same. Further, the Rules aim to reduce the use of hazardous substances in electrical and electronic equipment by specifying thresholds for the use of hazardous substances including lead, mercury and cadmium. When the Ministry had first notified the Rules for e-waste management in 2011, there existed limited understanding and awareness regarding various aspects of its management – including strategies to be adopted as well as infrastructural

capacity and capability to manage the waste stream. Even the provisions of the Rules were not time-tested as they were framed for the first time. Rules 2011were subsequently superseded by Rules 2016, and the latter further strengthened EPR as well as the provisions for restriction of hazardous substances (RoHS) in the manufacture of electrical and electronic equipment. The e-waste so collected is channelized to authorised dismantlers/recyclers. Currently, there are about 275 dismantlers/recyclers in 16 states/union territories in the country which have been given authorization under Rules 2016 by the concerned State Pollution Control Boards or Pollution Control Committees. Furthermore, the Hazardous (Management and Transboundary Movement) Amendment Rules, 2017 prohibits the import of hazardous and other wastes from any country into India for final disposal.

CONCLUSION

E-waste is an unavoidable part of our fast progressing life. The proper disposal of e-wastes has become the utmost necessity to save the environment and human health and to secure our personal data. Management e-waste has been a challenge for a developing country like India, not only because of the growing generation of its own e-waste, but also dumping of e-wastes from developed nations. However, the scenario is gradually improving. The electrical and electronic industry has been cooperating with the Government in the efficient management of e-waste and has taken various initiatives for handling e-waste responsibly. If the responsibility is shared between the Government, producers and consumers then efficient management of e-waste can be achieved successfully in India.