E-Waste: From Toxic to Green

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E-waste[1] is referred to as the world's fastest growing solid waste stream and the amount will more than double by 2050, reaching ~111 million tonnes annually.[2] India generated 1,014,961.2 tonnes of e-waste in FY20, 771,215 tonnes in FY19 and 708,445 tonnes in FY18.[3] We are currently the world's third largest e-waste generator, producing over 3.23 million metric tonnes per year, only behind the US and China.[4] Increasing consumption of electronics induced by the pandemic, led to digital learning, work-from-home models and the digitization drive which caused the volume of e-waste to rise nearly 43%.[5]

Seelampur in the national capital is India's largest unorganised recycling hub where 30,000 tonnes of e-waste are unceremoniously dumped without any treatment every day.[6] We know that the waste management value chain is largely informal with almost 95% of e-waste being recycled in a crude manner- either burnt or dumped into landfills.[7] Electronics contain toxic materials like lead, zinc, nickel, flame retardants, barium, and chromium. These chemicals, especially lead, if released into the environment cause damage to human blood, kidneys and nervous system. Irresponsible disposal of e-waste in landfills causes the toxic materials to seep into soil and contaminated groundwater, affecting all forms of lives, directly or indirectly.

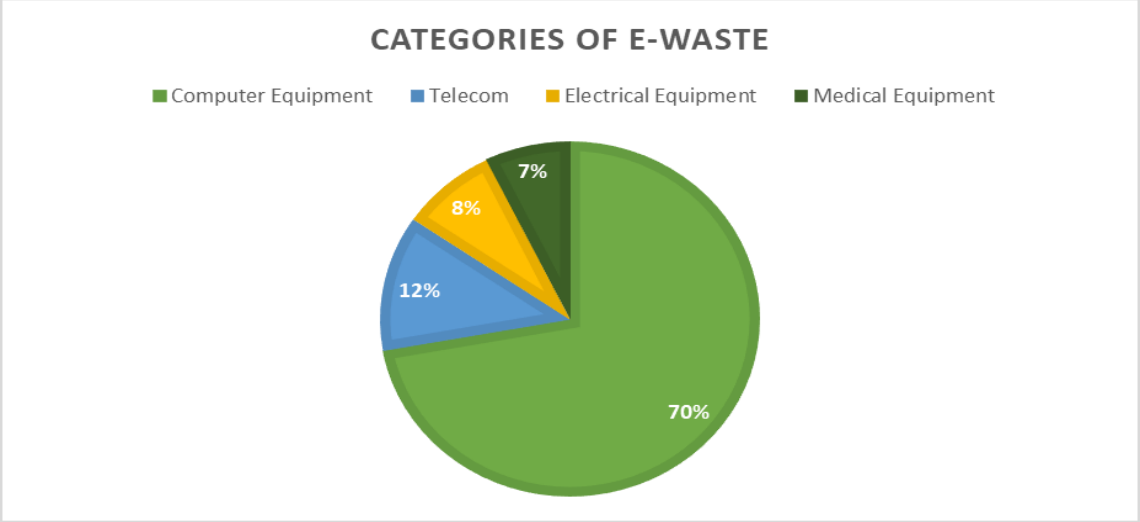


Fig 1: Categories of E-Waste as per study conducted by KPMG and ASSOCHAM in 2016[8]

[1] E-Waste (Management) Rules, 2016 defines e-waste as "any electrical and electronic equipment, whole or in part discarded as waste by the consumer or bulk consumer as well as rejects from manufacturing, refurbishment and repair processes."

[2] Future e-waste scenarios report, United Nations University-hosted Solving the E-waste Problem (StEP) Initiative, UN Environment

[3] Circular Economy in Electronics and Electrical Sector, Ministry of Electronics and Information Technology, Government of India

[4] E-waste Management in India, Confederation of Indian Industry

[5] Circular Economy in Electronics and Electrical Sector, MeitY, Government of India

[6] E-waste Management in India, Confederation of Indian Industry

[7] Dealing with e-waste, Livemint

[8] ASSOCHAM-KPMG Study

Urban areas have been the biggest contributors to the generation of e-waste as nearly 70% of e-waste comes from computer equipment. Telecom is the second largest driver of e-waste as India evolves digitally and the mobile phone revolution continues to unfold in rural areas. The impact of pandemic is explicit in terms of the dependency of humans on electronic gadgets.

The Way Ahead: Potential interventions to solve the challenge

Moving forward, integrated infrastructure that supports collection, transportation and segregation of e-waste, stronger governance that ensures e-waste is not discarded in a crude manner, proper recycling norms and greater awareness among citizens is the need of the hour to pause and decelerate the alarming rate at which e-waste is growing every year. The following are some of the interventions that address the challenges of rising volumes of e-waste:

Behavioural interventions

Circular Economy (CE):

- Circular Economy is an industrial system which is an alternative to the highly extractive and resource intensive linear economy principle of take-make-dispose. It replaces the end-of-life concept with restoration and regeneration, shifts towards usage of superior design of materials, products, systems and business models for waste elimination.
- Circular Economy increases the lifespan of products and retains value of resources at their highest through recovering, remanufacturing and regenerating products and materials.
- For example, Cisco, a leading US technology company committed to 100% product return and launched Cisco Refresh, Takeback and Reuse Program to deliver a full lifecycle solution.[9] Over the years, thousands of products have been remanufactured, millions of pounds of material kept away from reaching the scrap heap, and reliance on raw materials has been greatly reduced.[10] Microsoft, world's largest software and programming company, reuses and repurposes servers, hardware in Microsoft Circular Centers (CC). The CC model has achieved 83% reuse and 17% recycle of critical parts while contributing to the reduction of carbon emissions by 145,000 metric tons CO_2 equivalent.[11]

Refuse-Reduce-Reuse-Recycle-Repurpose (5Rs):

- A consumer is involved in the three key stages of a product life cycle: purchase, use, and end-of-life management. The role of consumer behaviour is a critical factor in defining the long-term success of sustainable production and consumption initiatives and this is where 5Rs play an important role.
- Reducing toxic substances by reusing old-underutilised devices and refusing new ones, recycling the exhausted ones through proper processes and repurposing the use of electronics shall increase the lifespan of products, optimize resource yields and mitigate the risks posed by e-waste. The goal of 5Rs is to educate people on how to prevent excessive and unnecessary waste.

[9] Cisco
[10] Circular Economy, Cisco
[11] Microsoft Circular Centers Program, Microsoft

- In 2019, 53.6 million tonnes of e-waste was generated worldwide of which only 17.4% was recycled.[12] This implies that gold, silver, copper, platinum and other high-value, recoverable materials conservatively valued at US$57 billion- a sum greater than the Gross Domestic Product of most countries- were mostly dumped or burned rather than being collected for treatment and reuse.[13]

Hence, inculcating behavioural interventions via 5Rs from consumption lens and Circular Economy from production lens will have direct implications to the process of solving the problem of e-waste.

Policy interventions

Extended Producers' Responsibility (EPR):

- EPR is a logical framework that helps in locating end-of-pipe solutions and contributes in minimising toxic waste through cleaner production technologies and input materials. The strategy makes the manufacturer (producer) of the product responsible for the entire life cycle and especially for the take back, recycling and final disposal of the product. EPR policy is characterised by:
    - the shifting of responsibility (physically and/or economically; fully or partially) upstream toward the producer and away from municipalities; and
    - the provision of incentives to producers to take into account environmental considerations when designing their products
- The strategic approach of EPR helps countries achieve higher collection and recycling rates of e-waste. For instance, Indore generates about 8000 metric tonnes of E-waste yearly and is the first Indian city to have started planning for implementation of an end-to-end EPR system in order to ensure proper treatment and disposal of e-waste.[14]
- Switzerland is the first country in the world to have established a formal e-waste system and the effective collection is primarily due to the Producer Responsibility Organisations based on the principle of EPR. Certain EPR schemes are complemented with specific tools to further increase recycling rates. For example, the Minnesota Electronics Recycling Act includes a system of recycling credits earned by producers when they collect more than their annual obligations. The environmental benefits of increasing recycling rates have also encouraged OECD[15] governments to expand the scope of products covered by EPR programmes.

System interventions

Unification of formal and informal sector:

- Waste collection value chain generally has the following 3 problems:

[12] Global E-waste Monitor 2020, International Telecommunication Union
[13] Global E-waste Monitor 2020, International Telecommunication Union
[14] India Environment Portal
[15] Organisation for Economic Co-operation and Development

- Lack of knowledge by the informal sector pertaining to the staff and their working conditions
- The dignity associated with the job is low so there is no motivation to work here but need a daily wage, and no access to other benefits like health care and so on
- No access to knowledge, information or aids to waste management

In addition, the waste generators are often unaware of basic behavioral change in segregation and consumption, and the impact it has on the larger ecosystem.

- The informal sector plays a significant role in the collection and management of e-waste, particularly in India. Improving the e-waste management system requires the collaboration of the informal sector with the civil society as well. Governments, NGOs, neighbourhood councils, e-waste workers must work in tandem to educate citizens on how to separate, handle and deposit end-of-life electronics.
- A partnership between the formal and the informal sector offers a number of advantages in the form of leveraging existing capabilities of informal workers and developing a formal approach to establish the systematic value chain of e-waste.
- NGOs such as Chintan work for environmental sustainability in partnership with people and groups from diverse sections of society to organize and formalize the value chain process. Chintan conducts training workshops through its "Scavengers to Managers" Programme where it attempts to direct attention towards safe access and proper handling of toxic materials. Sahaas launched a campaign called Alag Karo- a waste management programme in Gurugram, Haryana, to sensitise people about the implementation of waste segregation at source in 2017. So far, 1.5 million people have been directly reached through this campaign, 500+ waste-pickers have been trained and given access to safe workplaces, ~75,000 kg waste has been prevented from being dumped in landfills.[16]

Hence, there is a need for formal programs and efforts to increase awareness regarding e-waste management, drive action in unison with the informal workers and enable effective disposal mechanisms at all levels.

Key Influencers & Initiatives: Efforts towards solving the challenge

The alarming rate at which e-waste is rising exacerbates the existing environmental problems, increases the carbon footprint and contributes to human-made global warming. In an endeavour to address the e-waste crisis in the country, Centre of Excellence (CoE) in E-Waste Management had been established as a joint initiative by the Ministry of Electronics and Information Technology (MeitY), Government of India in partnership with the Government of Telangana and the industry. CoE aims to create a self-sustaining ecosystem capable of processing India's e-waste and to develop a physical infrastructure as well as a knowledge hub for the development of cost-effective technology for recycling solutions.

[16] The Targeted Impact, Alag Karo Initiative

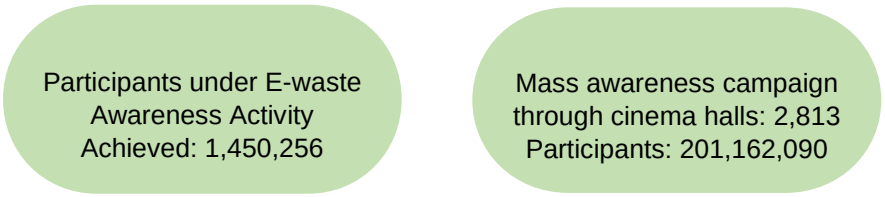
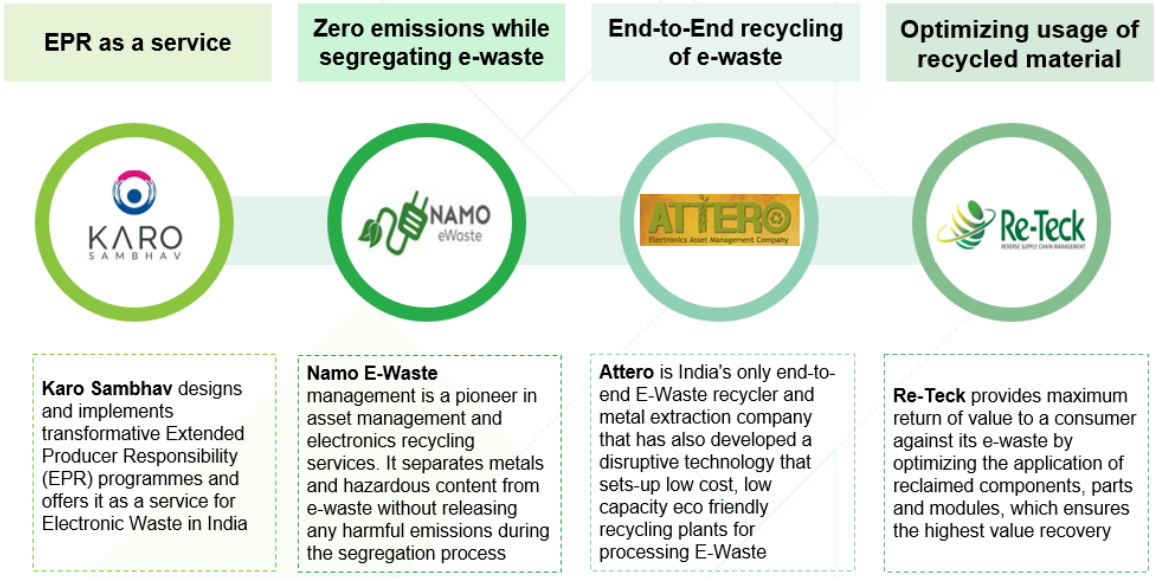


Fig 2: CoE Impact till date[17]

Companies like Wipro, HP, Acer and start-ups have launched awareness campaigns (such as *E-Waste hum le jayenge*) and developed models to create a sustainable, circular economy. The following start-ups are contributing their efforts to deal with the problem of e-waste by offering innovative solutions as a service:



In conclusion, the future scenarios of e-waste have, indeed, presented both challenges and opportunities in terms of minimizing wants, managing e-waste as well as developing cleaner and more sustainable products. It is important that viable solutions in forms of multi-stakeholder partnerships with government support and individual commitment are implemented to meaningfully slow consumption and better manage waste. More importantly, the cardinal principles of accountability, transparency, regulation and circular economy need to be incorporated in any policy on e-waste to ensure its proper implementation.

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[17] Ministry of Electronics and Information Technology

organisations in formulating their long-term impact strategy by aligning with business objectives and providing meaningful solutions to social issues.

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