

E-WASTE TRADE: ITS CAUSES, CONSEQUENCES, AND REGULATIONS IN INDIA

Chandan Kumar Sharma

Research Scholar, Jawaharlal Nehru University, New Delhi

Received: 05 Dec 2020

Accepted: 09 Dec 2020

Published: 10 Dec 2020

ABSTRACT

In this paper, we discuss e-waste, the trade of e-waste, the advantages and disadvantages of the e-waste trade. We also discuss the laws and regulations related to the e-waste trade at the national level in India. We find that the stockpile of e-waste has been increasing over the period both due to domestic production and the import of the e-waste. E-waste and its trade have both positive and negative effects on human health and the environment, however, the disadvantages are far more and significant than the advantages. While there are comprehensive laws and regulations at the national level in India, they are very susceptible for violation and not easily enforceable. A minuscule fraction of the total e-waste is recycled. People are not much aware of the management and end of life use of e-wastes. The conditions of workers in the e-waste recycling industry are very bad. Moreover, there is a lack of sound scientific waste management in India.

KEYWORDS: *E-Waste, Trade, Environment, India*

INTRODUCTION

Today, the electric and electronics industry is one of the fastest-growing industries in the world. The electric and electronic goods have a limited life; after that, they become wastes. These wastes are known as e-waste. In India, the stock of e-waste is rapidly growing due to rapid changes in information and technology, fashion, lifestyle, and status of people. Another significant component of this increasing e-waste is the exported e-waste by the developed countries. Although domestically created e-waste is enormous, the imported e-waste is not small in amount. Globalization has not only resulted in the trade of better goods but also the trade of wastes. The developed countries use developing countries as pollution havens. They dump their waste in the developing countries in South Africa, Asia, particularly in China and India. There are various hazardous effects of this trade on developing countries. Some of these effects are global and known as transboundary effects. This trade poses a rapidly growing threat to the environment and human health worldwide. However, these wastes also pose some positive externalities to human health and the environment.

What is E-Waste?

E-waste means electric and electronic waste. It is defined as discarded electric and electronic devices; for example, discarded computers, entertainment devices, mobile phones, televisions sets, radio sets, refrigerators, washing machines, microwave ovens, stereo sets, fluorescent light bulbs, tubes, and other digital equipment. On average, large household appliances constitute the most significant portion of the e-waste (around 50 percent), the information and communication technology equipment comes at second place (around 30 percent), and at third is the consumer electronics (around 10 percent) (ILO, 2012). According to this definition, these e-wastes are destined to reuse, resale, recycle, or dispose (Sirkeck

& Gupta, 2012). E-waste is the fastest-growing component of total waste. It is not hazardous if it is handled in a scientific manner, i.e., if it is stocked in safe storage or recycled by scientific method. However, it is dangerous if it is not stored in a proper manner, recycled by old or primitive methods.

E-wastes contain many harmful substances to the environment and human health and other living things. While some of the elements of e-waste are not harmful, most of them cause severe short-term and long-term harm to the environment and human health. Some of those elements are arsenic, barium, beryllium, cadmium, chlorofluorocarbon (CFC), mercury, lead, polyvinyl chloride (PVC), nickel, rare earth elements, selenium, zinc sulfide, lithium, chromium IV, etc. (Sirkeck & Gupta, 2012). Lead is one of the most hazardous elements of e-waste. It enters the human body through water, air, and food. Children are more susceptible to its harmful effects than adults (Mittal et al., 2012). Many of the above-discussed elements of e-waste can travel from one place to another via air, water bodies. So they can affect a major geographical area. On average, e-waste contains about 60 percent of metals (Table 1). Metals are usually useful, and they have a positive externality on the environment. Because extracted metals are reused, and so the pressure on the natural resources is relieved to some extent, most of the elements negatively affect the environment.

Table 1: Average Composition of Electronic Waste

Name of the Element	Percentage
Metals	60.20
Plastics	15.20
Screens	12.00
Meta Plastic Mixture	5.00
Pollutions	2.70
Cables	2.00
Printed Circuit Board	3.10

Source: Mittal et al., 2012.

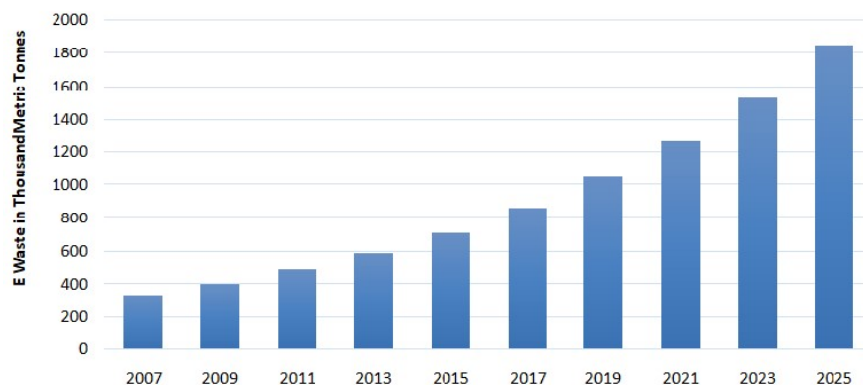
E-Waste Trade

Both kinds of harmless and hazardous e-wastes are traded globally. Harmless e-wastes include used papers, whereas the hazardous e-wastes include used computers, television sets, old ships, and even wastes that contain a great amount of toxic elements. There is a considerable amount of e-waste trade among developed countries. But the export of hazardous e-waste from developed to developing countries is enormous, and the developing countries are more vulnerable to the hazardous effects of these e-wastes on human health and the environment. In 1986, a British company established a large mercury-reprocessing plant in South Africa. And the company started importing the e-waste, wastes rich in mercury, from Britain to South Africa. Two years later, in 1988, the World Health Organization (WHO) published a report that revealed the hazardous effect of e-waste. The mercury content in a river, 50 km away from the company, water was one thousand times higher than the WHO standards. After some time, due to mercury poisoning, two workers died (Lipman, 2002). China is the world's largest importer country of e-waste. In 2004, China imported more than 12 billion tons of waste paper, over 10 billion tons of scrap iron and steel, and over 4 billion tons of plastic (ILO, 2012).

E-Waste in India

In India, the e-waste stock is growing at a compound rate of growth. We have been using electrical and electronics products for almost the last 60 years. Due to the rapid advancement of science and technology and the modern lifestyle, the use of these products has enormously increased in the past two decades. But we do not have a proper system to handle these e-wastes. Thus, massive stock of e-waste has been generated in India. Some part of this stock is domestically

generated, and another big part of it is the exports of some developed countries. This huge e-waste stock includes used computers, television sets, mobile handsets, refrigerators, other household and office use appliances, etc. E-waste stock in India is continuously increasing. Before 2017, the stock of e-waste in India was below 1,000 metric tonnes (Figure 1). The figure also shows us that the expected stock is rising very fast and is expected to reach 2,000 metric tonnes in the last years of the 2020s. Because over the years, the electrical and electronics industry has gained rapid growth.



Source: MAIT/GTZ study 2007.

Figure 1: The Estimated E-Waste Stock in India, over the Period 2007 to 2025

According to MAIT/GTZ 2007 study, the estimated total quantities of generated, recyclable and recycled e-waste in India were 3,32,973 tons, 14,443 tons, and 19,000 tons, respectively; the total quantity of e-waste processed consisted of 12,000 tons of computers e-waste and 7,000 tons of televisions e-waste in 2007. Furthermore, India had about 20 million computers, 2.2 million of which had become obsolete in 2007. As far as mobiles are concerned, in 2007, there were around 14 million mobile handsets which were replaced because the models had become obsolescence (MAIT-GTZ study, 2007).

E-wastes have severe adverse impacts on the environment, and its better management is highly technological and costly. There is a substantial transboundary movement of e-waste among developed countries and, more important, between developed and developing countries. On Average, 9 million tonnes of e-waste is collected in America. And most observers agree that about 20 percent of it is processed domestically, and 80 percent of it is exported to developing countries in Asia and Africa. While China is the world's e-waste capital, India is also a major importer of e-waste (The Economist, 6th September 2014). Recently, data on e-waste published by the United Nations University indicates that India produces more than 2 million tons of e-waste per year. This, combined with the imported e-waste, creates a continuous stockpiling in the country (The Hindustan Times, 2020). These data indicate that the import of e-waste is a significant portion of the total e-waste stock in India. Also, India imports waste papers since 1991. The import of paper waste to India has a good impact on the environment because the paper production by recycling uses less water and generates less solid waste. Also, the fiber extracted from the imported waste is better than domestically produced fiber for paper. Also, India is the world's largest ship-scraping country. Alang is a city in India, and it has the largest ship-scraping yard in the world.

Although China is the world leader in e-waste trading and while India is also a growing destination of e-waste trade despite regulations and laws. In India, there were no public waste service systems for municipal waste by 2012. The formal recycling system was small, and only 16 units of waste recycling units were licensed by the Central Pollution Control Board (CPCB) by 2012 (ILO, 2012). While the formal sector is small, the informal sector is significant and

growing. The informal sector is mostly not registered. The firms in the informal sector recycle the e-waste generated by the formal sector, too. The setup cost of the firms in the informal sector is low, and profit is high. Although the informal sector is not registered, they are highly coordinated to the firms in the industry. These firms conduct activities like recycling, reusing, and picking off the waste in the city. Poor, illiterate, and unskilled labor force of the city work in these firms. The firms also employ children and women for recycling and waste picking works. Most of the workers employed in these firms are migrant labours and women and children.

In cities like Delhi, Mumbai, Bangalore, Chennai, and Kolkata, the migrant workers are from Uttar Pradesh, Bihar, Orissa, and even the migrants from Bangladesh (ILO, 2012). Most of the firms are located in the cities, but due to high profit and well coordination, firms are also spreading to the rural sectors. New Delhi is the capital of India, which hosts many kinds of informal sector firms around it. Many of them are specialized for a particular e-waste activity. Table 2 presents the location of the firms handling e-wastes around Delhi. Working conditions in such firms are not favourable to the workers. These firms employ children, women, and migrant workers. The owners of the firms extract the maximum profit by paying the workers low wages and inadequate working environment.

Table 2: Delhi Recycling Locations

Location	Process and Components Recycled
Turkman Gate	Computer and CRT breaking
Mundka	Various electrical goods
Seelampur	Various electrical goods
Shastri Park	Computer dismantling, recharging of CRTs
Loni (Ghaziabad)	Various electrical goods
Mandoli (Ghaziabad)	Various electrical goods
Mandawali	Metal recovery work
Bawana	Various electrical goods
Narela	Various electrical goods
Meerut (near Delhi)	Gold recovery
Geeta Colony	Various electrical goods
TilaByetha (village in the outskirts)	Various electrical goods

Source: Jha, 2008; Lakhmi, 2010)

Note: CRT means Cathode Ray Tubes.

Advantages and Disadvantages of the E-Waste Trade

We have discussed above that trends in the trade of e-waste and, very briefly their effects on environment. However, there are many advantages and disadvantages related to this e-waste or waste import to the developing countries.

The traded e-wastes are usually recycled or reused in the urban areas of the developing countries. Urban areas consists of two sectors one is formal and another is informal. The informal sector mainly consists of individuals, poor families, and small enterprises. They earn their livelihood from the activities related to wastes picking, recycling, and reusing the e-waste. They also make the city clean by picking the wastes. The small entrepreneurs run non-registered firms. Their firms are small and mainly labour intensive. So they provide employment to the informal and unskilled labours. Some of the firms deals with e-wastes and by segregating the useful and un-useful elements of the waste, they provide the inputs to other industries at the lower costs. So their activities are the backbone to other small industries. Otherwise, those industries need to bear higher costs for the same inputs and so may not exist (Medina, 1997). The e-waste trading and its recycling and reusing provide the developing countries the scarce resources and also they remove, to a certain extent, a

huge pressure on natural resources for these metals and scarce resources. It also fosters the supply of raw materials to new industries in the developing countries at a lower cost (Prakash & Manhart, 2010)

Disadvantages are far greater than the advantages of the e-waste and its trade. There is an absolute lack of sound management of e-waste in developing countries. First, these countries generate a lot of e-waste each year. Second, they import another huge amount from the developed countries. There is an adverse effect of e-waste trade to developing countries. Because in these countries recycling, or reusing of the e-waste is done by labourers. So they are quite vulnerable to the hazards of the e-waste handling (SAICM, 2009). Today, the demand for the electronics and electrical products has increased many folds from the past years. This is because of the fastest changing technology and new inventions in these products. People simply switch to new products rather than keep using the old ones. These new products are highly technical and use more of the hazardous elements. Further the toxic materials and non-toxic materials are used in combination, usually bolted, glued or screwed, with each other. So segregating them sometimes becomes impossible and those valuable resources that can be reused are completely wasted (BAN, 2011).

The e-waste recycling and reusing firms are small and usually un-registered. The activities in these firms are labour intensive and these labourers come from the informal sector. The labourers are mostly uneducated, unskilled and highly poor. Labourers manually extract the useful metals. The recycling process is very complex in these kinds of firms. These processes include dismantling useful and useless components bare handed, burning the plastics in open to extract the metals without using any mask and gloves, using acid to melt the circuit board to extract the metals. These kinds of practices are very common in Delhi and China (ILO, 2012). There is always a possibility of accidental hazard to labourers if they make a slight mistake while working. The working places are usually congested and without proper ventilation. As we have discussed above, there are many types of toxics present in these e-wastes. When they work on these e-wastes they inhale these gases and become ill. There is a lack of equipment provision by the firms. The wages paid to these workers are very low. Further there is a lack of sanitation facilities, toilets, water, and so on at the working place. Their hands and bodies contact these toxics and when they eat meals these toxics reach in their stomach and causes several severe health problems. Also, they are good circulators of these toxics from one place to another place. Their clothes are dirty and affected by the chemicals and toxics when they work in the firm. They usually wear the same cloth at home and work sites so the clothes spread the harmful effects around their usual visiting places.

Also, there are always high chances of environmental problems around the firms. Environment around the firms are not good. Stock of the hazardous e-waste in open emits hazardous gases and the environment around the firms gets polluted. People around these firms are vulnerable to the hazards. The recent example of this can be the Mayapuri case in Delhi. Not only workers but their generations are badly affected by the hazardous effect of e-waste. There are long term effects of the e-waste long time exposure. These effects include birth defects, tuberculosis, blood related diseases, and skin related diseases, kidney and lung damage, underdevelopment of the brain of their children. These effects become more severe if the pregnant women work in these firms as it usually happens (Prakash & Manhart, 2010). Children are affected in two ways. First, if their mother were working on e-waste recycling sites then the children have high chances of disability by birth. Second, poor children are vulnerable to work in waste industry. They usually pick rags around the small city. They are also employed in burning plastics or other wastes to segregate the important metals (Prakash & Manhart, 2010). Girl child are more vulnerable to be doing these works. Children's minds and bodies are still developing and so they are

more susceptible to the hazards of the e-waste than adults. They usually suffers diseases like stomach related diseases, skin problem, and breathing problems.

In several developing countries firms provide waste disposal services to the developed countries legally or illegally. The waste disposal service is mostly related to putting the waste under the land, known as landfill. There are many severe effects of this activity. First, the land is polluted. Second, this land can be utilized in some other better ways. Third, it pollutes the water sources around the landfills. Forth, animals are badly affected when they graze around these landfill areas. Sixth, human is affected no matter whether he or she is vegetarian or non-vegetarian. Because, vegetables and animals carry these toxics inside them. And when human eat the animals' meat and vegetable, they become infected. Water bodies are also polluted from the leakages and the direct dumping of the wastes and e-waste into them. It causes the inhalation of hazardous toxics by human and animals. There is air pollution and air is a good source of secondary effect of these hazardous toxics. The gases spread in the air move from one place to around the place and cause damage to a big geographical area. An example of this can be the Bhopal Gas Tragedy. E-wastes like used computers, mobile phones still carries important personal data related to organizations, persons. If the data stored in them are not completely destroyed before declaring it waste and sold as scraps, the data can be misused by others.

Regulatory Frameworks in India

As we have already discussed above, the e-waste poses some advantages and some disadvantages to the human health and environment. But the mishandling, illegal trading, and informal activities related to the e-wastes outweigh the hazardous effects over the benefits. There are many regulatory frameworks to control the e-waste transboundary trade whether it is legal or illegal, at the international level. Also, many countries have regulatory frameworks at national level.

There are several regulatory frameworks at the international level, which includes the Basel Convention 1989, the Rotterdam Convention, and the Stockholm Convention 2004. The Basel Convention is the most comprehensive and significant Multilateral Environmental Agreement. It controls the illegal trading of e-waste and the legal, too. It puts a limit to the level of e-trade on the signatory countries. The Rotterdam Convention covers the ban on the harmful chemically rich wastes trade, like the trade of industrial chemicals and pesticides. The ban is mutually agreed by the participating countries of the Rotterdam Convention. The Stockholm Convention was signed in 2001 and came into force in 2004. It promotes the restriction of release of Persistent Organic Pollutants (POPs).

Although, there are many laws and regulations in India, they are either inadequate to control the e-waste related illegal activities or they are too much cumbersome to be enforced. Some of the prominent regulations are the Environment Protection Act, 1986; Hazardous Waste Rules 1989; and the Task Force on E-Waste 2005. Environment Protection Act 1986 was the first comprehensive law to deal with the activities related to damaging environment and human health. It was formulated after the Bhopal Gas Tragedy. Under the Hazardous Waste Rules 1989, e-waste is not treated as hazardous as long as they are not proved to have higher concentration of hazardous elements like mercury, lead, and cadmium and so on. These rules are easy to be violated by the firms indulged in waste recycling and reusing activities (Josheph, 2007). These rules were amended in 2000 and 2003. According to these rules, import of e-wastes requires prior permission of the Ministry of Environment and Forests. But it is not able to deal with the complexities of e-wastes. These rules are too cumbersome to implement.

A task force on e-waste was constituted in 2005 to propose new legislation related to e-waste. On October 4th, 2010 the Government announced that a new e-waste related law will come into force from May 1st, 2012. The new set of rules under the new e-waste legislation require the mandatory registration of all the firms, either they belong to formal or informal sector, which deal with the e-waste. So, this was a good initiative to formalize the informal sector by registering them. It also incorporated the Extended Producer Responsibility (EPR) principle. EPR principle requires the producers of electronics products to take financial responsibility to dispose their products when the products become obsolete. New e-waste legislation motivates the producers of electrical and electronics products to use less amount of hazardous substances in production.

CONCLUSIONS AND POLICY RECOMMENDATIONS

Problems caused by e-waste to human health and environment are continuously growing. And with the regular advancement of information and technology these are to be more severe in future. Better ways of management of the e-waste is need of the hour. Because e-wastes possess one of the major threats to human health and environment; Government, manufacturers, NGOs, and citizens should work in conjunction with each other to resolve this growing threat. Establishing the e-waste collection, recycling and exchange centers should be encouraged by the government and manufacturers. Targeting poverty and unemployment is also important because as we discussed above the poor and unemployed people end up working in informal firms' hazardous environment. E-waste is good also but only if managed well. Recycling of e-waste in sound scientific manner has positive externality on environment and human health. Because this kind of recycling provides inputs and reduces the increasing burden on natural resources on the one hand. On the other hand this reduces the damage to environment. Last but not least, educating people about the management of e-wastes and threats of e-waste to human health and environment is very important.

REFERENCES

1. Basel Action Network (BAN). 2011. Toxic trade news: "Cochin Port a safe conduit for imported e-waste".
2. Depczyk, J. (2014). Difference engine: When gadgets go to die, *The Economist*, September 6th 2014. Available at <https://www.economist.com/technology-quarterly/2014/09/04/where-gadgets-go-to-die>.
3. Jha, G. (2008). Delhi: the world's e-waste capital, *Hindustan Times*, 6 Oct. Available <https://www.hindustantimes.com/business/delhi-the-world-s-e-waste-capital/story-YRKfktuTI6gzdwawaBpcfJ.html>
4. Josheph, K. (2007). Electronic Waste Management in India-Issues and Strategies, *Proceedings Sardinia 2007, Eleventh International Waste Management and Landfill Symposium S. Margherita de Pula, Cagliari, Italy; 1-5 October 2007*.
5. Lakshmi, R. (2010). Recycling India's e-waste brings jobs to the poor – and health, environment Fears. *Washington Post*, 12 June. Available: <http://www.washingtonpost.com/wp-dyn/content/article/2010/06/11/AR2010061106103.html>
6. Lipman, Z. (2002). A dirty dilemma: the hazardous waste trade. *Harvard International Review*, 23(4), 67.
7. Lundgren, K. (2012). *The global impact of e-waste: addressing the challenge*. International Labour Organization.

8. Medina, M. (1997). *Informal recycling and collection of solid wastes in developing countries: Issues and opportunities*. UNU, Institute of Advanced Studies.
9. Mittal, D.; Goel, N.; Rani, R. (2012). *E-Waste: A Hidden Threat to Global Environment & Health*, *VSRD International Journal of Computer Science & Information Technology*, Vol. 2 (3), 2012, 271-275.
10. Prakash, S., Manhart, A., Amoyaw-Osei, Y., & Agyekum, O. O. (2010). *Socio-economic assessment and feasibility study on sustainable e-waste management in Ghana*. Öko-Institut eV in cooperation with Ghana Environmental Protection Agency (EPA) & Green Advocacy Ghana, Ministry of Housing, Spatial Planning and the Environment, VROM-Inspectorate.
11. Report on "E-waste Inventorisation in India", MAIT-GTZ Study, 2007
12. Sirkeck, G.; Gupta, G. (2012). *Managing E-Waste in India: A Review*, *International Journal of Scientific & Engineering Research*, Volume 3, Issue &, July-12.
13. *Strategic Approach to International Chemicals Management (SAICM)*. 2009. *Background information in relation to the emerging policy issue of electronic waste*, paper presented at the *International Conference on Chemicals Management*, Geneva, 11-15 May.
14. *World Environment Day 2020: Can the Purchase of second-hand products be considered a sustainable practice?*, *The Hindustan times*, June 5th, 2020. Available at <https://www.hindustantimes.com/more-lifestyle/world-environment-day-2020-can-the-purchase-of-second-hand-products-be-considered-a-sustainable-practice/story-ZMAE1XcPEERKVGczgmV8hI.html>