E-Waste: A Major Health And Environmental Problem In India

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Abstract

Electronic waste (e-waste) refers to the disposal of broken or obsolete electrical and electronic components and materials. E-waste is a popular, informal name for electronic products nearing the end of their "useful life." Computers, televisions, VCRs, stereos, CD, copiers, mobiles, fax machines, microwave and other similar appliances are common electronic products. Many of these products can be reused, reduced and recycled. E-waste is now the fastest-growing waste stream in the world. The UN has called it a tsunami of e-waste. Currently, only a few countries have a uniform way of measuring this waste. There are concerns about the availability and supply of new materials for electronics and electrical devices in the future. Yet e-waste contains many high-value and scarce materials, such as gold, platinum, cobalt, rare earths, and high quantities of Aluminum and tin. E-waste presents a potential security threat to individuals & exporting countries and poses a critical issue in terms of solid waste management. Certain components of some electrical and electronic products contain materials that render them hazardous, depending on their condition and density. The processes of dismantling and disposing of electronic waste in developing countries like India led to a number of environmental impacts. Liquid and atmospheric releases end up in bodies of water, groundwater, soil, and in air; therefore affected both domesticated and wild animal in land and sea, in crops and drinking water eaten by both animals & human and harming ecosystem. Rapid innovation and lowering costs have dramatically increased access to electronic products and digital technology with many benefits. This has led to an increase in the use of electronic devices and equipment and creating e-waste. E-waste comes from many sources including households, businesses and governments. E-waste is the toxic legacy of our digital age. It's high time to fix the problem.

Key words: Solid waste management, Rapid Innovation, Toxic legacy.

Introduction: Electronic waste (e-waste) refers to the disposal of broken or obsolete electrical and electronic components and materials. E-waste is a popular, informal name for electronic products nearing the end of their "useful life." Computers, televisions, VCRs, stereos, CD, copiers, mobiles, fax machines, microwave and other similar appliances are common electronic products. Electronic waste is emerging as a serious public health and environmental problem all over world. This problem has been creating a serious environmental and health issue in India also. India is the 5th largest electronic waste producer in the world and has emerged as the world's second largest mobile market. India imports an undisclosed amount of e-waste from other advanced countries around the world. India discarding roughly 1.5 lakh

tones of electronic waste each year, a study says. Telecom equipment alone accounts for 12 per cent of the e-waste, a joint study by ASSOCHAM-KPMG, an industrial body in India. The rising levels of e-waste generation in India have been a matter of concern in recent years. With more than 100 crore mobile phones in circulation, nearly 25 per cent end up in e-waste annually. The Ministry of Environment, Forest and Climate Change has notified e-waste management rules 2016, in which producers are for the first time covered under Extended Producers' Responsibility (EPR). According to ASSOCHAM, the Compound Annual Growth Rate (CAGR) of electronic waste is 30%. With changing consumer behavior and rapid economic growth, ASSOCHAM estimates that India will generate 5.2 million tons of e-waste by 2020. While e-waste recycling is a source of income for many people in India, it also poses numerous health and environmental risks. More than 95% of India's e-waste is illegally recycled by informal waste pickers. These workers operate independently, outside of any formal organization which makes enforcing e-waste regulations difficult to impossible. Recyclers often rely on rudimentary recycling techniques that can release toxic pollutants into the surrounding area. The release of toxic pollutants associated with crude e-waste recycling can have far reaching, irreversible consequences. In India the amount of e-waste generated differs from state to state. The three states that produce the most e-waste, they are mainly Maharashtra, Tamilnadu and Andhra Pradesh. Other states that produce significant e-waste are Uttar Pradesh, West Bengal, Delhi, Karnataka, Gujarat, Madhya Pradesh and Punjab. We have seen that e-waste is disproportionately generated in urban areas. Indian cities generate more than 60% of India's total e-waste. Mumbai is the top e-waste producer followed by Delhi, Bangaluru, Chennai and Kolkata. (Hindu: 15th May.2016)

Health and environmental impact: Electronic equipments contain many hazardous metallic contaminants such as lead, cadmium, and beryllium and brominates flame retardants. The fraction including iron, copper, aluminum, gold and other metals in e-waste is over 60%, while plastics account for about 30% and the hazardous pollutants comprise only about 2.70%. Growing e-waste problem is a great concern and most of the people in India are not aware of how they can contribute to reduce this problem. Most of the people in India don't know the concept of reduce, reuse and recycle concept of e-waste. It has become an important problem to rationalize electronic waste management systems for the environment. These have been creating a health hazards with the usage of electrical and electronic equipment (EEE) on the rise. The amount of electrical and electronic waste produced each day is equally growing enormously around the globe. Of many toxic heavy metals, lead is the most widely used in electronic devices for various purposes, resulting in a variety of health hazards due to environmental contamination through food, water, air, and soil. Children are particularly most vulnerable to lead poisoning than adults because they absorb more lead from their environment and their nervous system and blood get affected. The processes and techniques used during the recycling activities are very primitive. Recycling of valuable elements contained in e-waste such as copper and gold has become a source of income mostly in the informal sector of developing or emerging industrialized countries. Furthermore, recycling activities such as dismantling of electrical equipment may potentially bear an increased risk of injury. Workers in e-waste disposal sector are poorly protected against the risk of it. They dismantle e-waste often by hand, in dreadful conditions. About 25,000 workers are employed at scrap-yards in Delhi alone, where 10,000 to 20,000 tons of e-waste is handled every year, with computers accounting for 25 percent of it. Other e-waste scrap-yards exist in Meerut, Firozabad, Chennai, Bangalore and Mumbai.

The e-waste problem has been alarming in India because India generates about 1.5 lakh tones of e-waste annually and almost all of it finds its way into the informal sector as there is no organized sector available at present. Especially, metropolitan cities like Delhi, Mumbai and Bangaluru are at higher risk of environmental pollution due to e-waste. A study reveals that the Mumbai city faces grave health and environmental risks posed by a dump of 19,000 tones of electronic waste produced every month, above these same being imported from other developed countries. The rate of e-waste generation and the current methods of disposal in Mumbai pose a grave environmental and health risks to the city at large due to high density of population. A study on e-waste by the Chittaranjan National Cancer Institute, Kolkata reveals that people in Delhi are about twice as likely to suffer from lung ailments as those in the countryside due to the huge amount of generated e-waste. Bangaluru has been generating about 10,000 tons to 15,000 tons of e-waste every month, as received from different industrial sources. Karnataka State Pollution Control Board has reveals that Karnataka generates about 10,000 tons monthly. The amount of e-waste generated poses a grave threat to the environment as well as to public health in Karnataka and surrounding area.

The hazardous substances found in the e-waste include substantial quantities of lead, cadmium, chromium and flame-retardant plastics. There are no sanitization and masks cover facilities amongst the e-waste pickers & gatherers. So, it becomes a health risk. Cathode ray tubes and components with high lead content are considered dangerous to health. Inhaling or handling such substances and being in contact with them on a regular basis can damage the brain, nervous system, lungs, kidneys and the reproductive system. Those are working in poor-ventilated enclosed areas without masks and technical expertise results in slow poisoning to their health. Due to lack of awareness, workers are risking their health and environment as well. Various studies have shows the soaring levels of toxic heavy metals and organic contaminants in samples of dust, soil, river sediment, surface water, and groundwater in India. In the same areas, the residents had a high incidence of skin damage, headaches, vertigo, nausea, chronic gastritis, and gastric and duodenal ulcers, etc. There is an urgent need for improvement in e-waste management covering technological improvement, institutional arrangement, operational plan, protective protocol for workers working in e-waste disposal and last but not the least education of general population about this emerging issue posing a threat to the environment as well as public health.

E-waste scenario in India: India ranks 177 amongst 180 countries relating to e-waste generation and is amongst the bottom 5 countries on the EPI (Environmental performance Index), 2018, a report from World Economic Forum (WEF), 2018.India shows poor performance in environment health policy and for that reason death rate is alarming due to air pollution .Also, India is ranked fifth in the world amongst top e-waste producing countries after the USA, China, Japan, and Germany and recycles less than 2 per cent of the total e-waste it produces annually. Since 2018, India generates more than two million tons of e-waste annually, and also imports huge amounts of e-waste from other advance countries around the world. Dumping in open dumpsites is a common sight which gives rise to issues such as groundwater contamination, poor health, and more. The Associated Chambers of Commerce and Industry of India (ASSOCHEM), KPMG and Electronic Waste Management in India identified that computer equipment account for almost 70 per cent of e-waste, followed by telecommunication equipment phones (12 per cent), electrical equipment (8 per cent), and medical equipment (7 per cent) with remaining from household e-waste. E-waste collection, transportation, processing, and recycling are dominated by the informal sector. The sector is well networked and unregulated. In addition, there are serious issues regarding leakages of toxins into the environment and workers' safety and health. Seelampur in Delhi is the largest e-waste dismantling centre in India. Adults as well as children spend 8–10 hours daily extracting reusable components and precious metals like copper, gold and various functional parts from the devices. E-waste recyclers use processes such as open incineration and acid-leeching. This situation could be improved by creating awareness and improving the infrastructure of recycling units along with the prevalent policies. The majority of the e-waste collected in India is managed by an unorganized sector. Also, informal channels of recycling or reuse of electronics such as repair shops, used product dealers, e-commerce portal vendors collect a significant proportion of the discarded electronics for reuse and cannibalization of parts and components.

There are concerns about the availability and supply of new materials for electronics and electrical devices in the future. Yet e-waste contains many high-value and scarce materials, such as gold, platinum, cobalt, rare earths, and high quantities of Aluminums and tin. E-waste presents a potential security threat to individuals & exporting countries and poses a critical issue in terms of solid waste management. Certain components of some electrical and electronic products contain materials that render them hazardous, depending on their condition and density. The processes of dismantling and disposing of electronic waste in developing countries like India led to a number of environmental impacts. Liquid and atmospheric releases end up in bodies of water, groundwater, soil, and in air which affects both domesticated and wild flora & fauna in land and sea surfaces, in crops and drinking water eaten by both animals & human and harming ecosystem. Rapid innovation and lowering costs have dramatically increased access to electronic products and digital technology with many benefits. This has led to an increase in the use of electronic devices & equipment and creating e-waste. E-waste comes from many sources including households, businesses and government offices, companies, etc. E-waste is the toxic legacy of our digital age. It's high time to fix the problem.

Now a day's e-waste is one of the fastest growing pollution problems which are increasing almost three times than that of municipal waste globally. With the rapid development of electronics items in IT sector, increase in consumption of electronic goods also increases. As there is no separate collection policy of e-waste in organized sector in India. It has been observed that in most of the cases electronic

items are stored unguarded, unsupervised because of lack of law, knowledge and proper management system. Generally, such electronic junks used to seen in houses, offices, warehouses, etc. and these wastes are mixed with household wastes which are finally disposed of at landfills. Currently, only a few countries have a uniform way of measuring this waste. There is paucity of data on burdens of heavy metal exposure on environment and human body in India. A large number of workers including small children are exposed to different e-waste picking and dismantling activities. There are no data available about the health implications of these workers. They might be ruining their lives in the lack of appropriate knowledge.   This necessitates implementation of appropriate management measures including stringent regulations. The management practices currently in operation in India have severe health and environmental implications. The Ministry of Environment, Forest and Climate Change rolled out the e-waste management Rules in 2016 to reduce e-waste production and increase recycling. Under these rules, the government introduced EPR which makes producers liable to collect 30 per cent to 70 per cent (over seven years) of the e-waste they produce, said the study. The integration of the informal sector into a transparent recycling system is crucial for a better control on environmental and human health impacts. There have been some attempts towards integrating the existing informal sector in the emerging scenario. Organizations such as GIZ India have developed alternative business models in guiding the informal sector association towards authorization. These business models promote a city-wide collection system feeding the manual dismantling facility and a strategy towards best available technology facilities to yield higher revenue from printed circuit boards. By replacing the traditional wet chemical leaching process for the recovery of gold with the export to integrated smelters and refineries, safer practices and higher revenue per unit of e-waste collected are generated. It is one of the components of Reduce, Reuse and Recycle of e-waste. Reduce generation of e-waste through smart procurement and good maintenance. Reuse still functioning in electronic equipment by selling it to someone who can still use it. E-waste is also a rich source of metals such as gold, silver, copper, etc. as mentioned above which can be recover and brought back into the production cycle. There are also some significant socio-economic potential in the efficient recovery of valuable e-waste materials which can provide income generating opportunities for both individuals and enterprises. Following table shows various e-waste sources, their constituents and its impact on health.

Table: Various e-waste sources, their constituents, and health impacts.

E-waste sources	Constituents	Health effects
Solder in printed circuit boards, glass panels and gaskets in computer monitors.	lead	a) Damage to central and peripheral nervous system, blood system and kidney damage. b) Adverse effects on brain development of children: causes damage to the circulatory system and kidney.
Chip resistors and semi conductors	cadmium	a) Toxic irreversible effects on human health b) Accumulates in kidney and liver. c) Causes neural damage.
Relay and switches , printed circuit boards	mercury	a) Chronic damage to the brain. b) Respiratory and skin disorder due to bioaccumulation in fishes

Galvanized steel plates and decorator and hardener for steel housing	chromium	Causes bronchitis
Cabling and computer housing	plastics and PVC	Burning produces dioxin that causes reproductive and developmental problems
Electronic equipment and circuit board	brominates flame retardants	Disrupt endocrine system functions
Front panels of CRTs	barium and phosphorous , heavy metals	Causes muscle weakness and damage to the heart, liver and spleen
Copper wires, printed circuit boards tracks	copper	Stomach cramps, nausea, liver damage, Wilson's disease
Nickel cadmium rechargeable batteries	nickel	Allergy of the skin to nickel results in dermatitis while allergy of the lung to nickel results in asthma
Lithium ion battery	lithium	a) Lithium can pass into breast milk and may harm a nursing body. b) Inhalation of the substance may cause lung edema.
Motherboard	beryllium	a) Carcinogenic (lung cancer). b) Inhalation of fumes and dust causes chronic beryllium diseases or beryllium disease or beryllicosis.

Courtesy: www.ban.org

Research on e-waste management in India: In India individual research on e-waste is not going on in a proper way. Most of the researches are done in reference to pollution and environment. Now many more environmental epidemiological studies are required to assess the present status of e-waste management system in India, to assess the e-waste quantities and exact amplitude of the problem in Indian cities and towns, and to establish relationships with the informal recycling sectors. The valuable data will be generated by these studies that would help in drafting an action plan for e-waste management. India should start a surveillance system for diseases and health consequences of e-waste. The sustainability of e-waste management systems has to be ensured by improving the collection and recycling systems. It would be desirable to establish public-private partnerships in setting up buy-back or drop-off centers. Levying advance recycling fees is another approach to ensure waste management sustainability. To identify best e-waste management technologies across the globe and adopt them successfully may be a tool for a sustainable futuristic growth. The reduction of the hazardous substances in the electronic and electrical equipments and the promotion of use of their safer substitutes many countries have adopted the Restriction of Hazardous substances (RoHS) regulations in the manufacture of these items. More and more such less hazardous substitutes should be identified which can be used in electronic equipments (Monika, Kishore, Jugal :2010).

Conclusion: The challenges of managing e-waste in India are very different from those in other countries, both the developed and developing. No doubt, there are several complexity of the e-waste issue in India in the case of vast geographical and cultural diversity and economic disparities. No accurate estimates of the quantity of e-waste in India. The challenges of managing e-waste in India are very different from those in other countries, but we have to take challenges to tackle the problems.. It seems less awareness amongst e-waste pickers, gatherers, manufacturers and consumers, which may create hazards due to incorrect e-waste disposal system. There is an urgent need of e-waste management covering technological improvement, operation plans, implementing a protective protocol for the workers in e-waste disposal and educating public about this emerging issue which is posing a threat to the environment as well as public health. The hazardous nature of e-waste is one of the rapidly growing environmental problems of the world. The ever increasing amount of e-waste associated with the lack of awareness and appropriate skill is deepening the problem. A large number of poor workers are involved in dismantling of these electronic items for their livelihood but their health is at risk. Therefore central and state govt. should arrange some plans and programmes to prevent the health hazards for e-waste handling workers in India. Ministry of environment, Health and Industry of govt. of India may prepare some strategy and action plan to tackle such problems. State govt. also may prepare some action plan through panchayat & NGO. Required information should be provided to these workers regarding safe handling of e-waste and personal protection. For e-waste management many technical solutions are available, but to be adopted in the management system, prerequisite conditions such as legislation, collection system, logistics, and manpower should be prepared. This may require operational research and evaluation studies.

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