E-WASTE MANAGEMENT REGIME IN INDIA

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INTRODUCTION

The production of electrical and electronic equipment (EEE) is one of the fastest growing global manufacturing activities. Rapid economic growth, coupled with urbanization and a growing demand for consumer goods, has increased both the consumption and the production of EEE.[1] The Information Technology (IT) industry has been one of the major drivers of change in the economy in the last decade and has contributed significantly to the digital revolution being experienced by the world. Over the last decades the electronics industry has revolutionized the world: electrical and electronic products have become ubiquitous of today's life around the planet. Without these products, modern life would not be possible in (post-) industrialized or industrializing countries. New electronic gadgets and appliances have infiltrated every aspect of our daily lives, providing our society with more comfort, health and security and with easy information acquisition and exchange. The knowledge society however is creating its own toxic footprints.

The same hyper technology that is hailed as a 'crucial vector' for future modern societal development has a not-so-modern downside to it: electronic waste (e-waste). With the usage of electrical and electronic equipment (EEE) on the rise, the amount of electrical and electronic waste (e-waste) produced each day is equally growing enormously around the globe.[2] E-waste broadly covers waste from all electronic and electrical appliances and comprises of items such as computers, mobile phones, digital music recorders/players, refrigerators, washing machines, televisions (TVs) and many other household consumer items.[3] E-waste is usually

[1] Sinha S., *Downside of the Digital Revolution.* Published in Toxics Link, 28/12/2007. Available from: <http://www.toxicslink.org/art-view.php?id=124> (data retrieved on 20th March, 2018).

[2] <http://www.who.int/ceh/risks/ewaste/en/> (data retrieved on 20th March, 2018).

[3] <http://www.ijoem.com/article.asp?issn=00195278;year=2008;volume=12;issue=2;spage=65;epage=70;aulast=Pinto> (data retrieved on 20th March, 2018).

regarded as a waste problem, which can cause environmental damage and human health if not safely managed.

WHAT IS E-WASTE?

Electronic waste or e-waste is defined as discarded electrical or electronic devices. Used electronics which are destined for reuse, resale, salvage, recycling or disposal are also described as e-waste. Informal processing of electronic waste in developing countries may cause serious health and pollution problems, as these countries have limited regulatory oversight of e-waste processing. Electronic waste or e-waste is the term used to describe old, end-of-life electronic appliances such as computers, laptops, TVs, DVD players, mobile phones, mp3 players, etc., which have been disposed by their original users.

The most widely accepted definition of WEEE/ E-waste is as per an EU directive, which says:

"Electrical or electronic equipment which is waste including all components, subassemblies and consumables, which are part of the product at the time of discarding." Article 1(a) defines "waste" as "any substance or object which the holder disposes of or is required to dispose of pursuant to the provisions of national lawin force."[4]

(a) *'electrical and electronic equipment' or 'EEE' means equipment which is dependent on electrical currents or electromagnetic fields in order to work properly and equipment for the generation, transfer and measurement of such current and fields falling under the categories set out in Annex IA to Directive 2002/96/EC (WEEE) and designed for use with a voltage rating not exceeding 1000 volts for alternating current and 1500 volts for direct current.*

According to USEPA, electronic products that are "near" or at the "end of their useful life" are referred to as "e-waste" or "e-scrap." Recyclers prefer the term "e-scrap" since "waste" refers only to what is left after the product has been reused, recovered or recycled. However, "Ewaste" is the most commonly used term.[5]

[4] "E-Waste-Inventory Assessment Manual" compiled by United Nations Environmental Programme Division of Technology, Industry and Economics International Environmental Technology Centre, available on <*www.unep.or.jp/ietc/Publications/spc/EWasteManual_Vol1.pdf*> (data retrieved on 20th March, 2018)
[5] Ibid.

Basel Action network defines E-waste as:

"E-waste encompasses a board and growing range of electronic devices ranging from large household devices such as refrigerators, air conditioners, cell phones, personal stereos, and consumer electronics to computers which have been discarded by their users."[6]

E-waste has been categorized into three main categories, i.e., Large Household Appliances (42%), IT and Telecom (33.9) and Consumer Equipment (13.7). Refrigerator and washing machine represent large household appliances; PC, monitor and laptop represent IT and Telecom, while TV and mobile phones, MP3 players represent Consumer Equipment.

The main sources of computer usage and thereby e-waste generations are the business sector (government departments, public or private sector, multinational corporation offices, etc.), accounting for 78% of the total installed PCs today. Other sources are individual households (22%), foreign embassies, PC manufacturing units, PC retailers, secondary markets of old PCs and imported electronic scrap of other countries.

SOME STATISTICS[7]

1. Roughly 40 million metric tons of electronic waste (e-waste) are produced globally each year, and about 13 percent of that weight is recycled mostly in developing countries.
2. About 9 million tons of this waste—discarded televisions, computers, cell phones, and other electronics—are produced by the European Union, according to the United Nations Environment Programme (UNEP). And UNEP notes that this estimate of waste is likely too low.
3. Informal recycling markets in China, India, Pakistan, Vietnam, and the Philippines handle anywhere from 50 percent to 80 percent of this e-waste, often shredding, burning, and dismantling the products in "backyards." Emissions from these recycling practices are damaging human health and the environment.
4. Developing countries with rapidly growing economies handle e-waste from developed countries, and from their own internal consumers. Currently, an estimated 70 percent of e-waste handled in India is from other nations, but the UNEP estimates that between

[6] Ibid.

[7] <http://www.prb.org/Publications/Articles/2013/e-waste.aspx> (data retrieved on 30th March, 2017)

2007 and 2020, domestic television e-waste will double, computer e-waste will increase five times, and cell phones 18 times.

5. The USA discards 30 million computers each year and 100 million phones are disposed of in Europe each year. The Environmental Protection Agency estimates that only 15 - 20% of e-waste is recycled, the rest of these electronics go directly into landfills and incinerators.
6. E-waste represents 2% of America's trash in landfills, but it equals 70% of overall toxic waste.
7. For every 1 million cell phones that are recycled, 35,274 lbs of copper, 772 lbs of silver, 75 lbs of gold, and 33 lbs of palladium can be recovered.

HAZARDOUS E-WASTE MATERIALS

1. Americium: The radioactive source in smoke alarms. It is known to be carcinogenic.
2. Beryllium oxide: Filler in some thermal interface materials such as thermal grease used on heat-sinks for CPUs and power transistors, magnetrons, X-ray-transparent ceramic windows, heat transfer fins in vacuum tubes, and gas lasers.
3. BFRs: Used as flame retardants in plastics in most electronics. Includes PBBs, PBDE, DecaBDE, OctaBDE, PentaBDE. Health effects include impaired development of the nervous system, thyroid problems, liver problems.
4. Cadmium: Found in light-sensitive resistors, corrosion-resistant alloys for marine and aviation environments, and nickel-cadmium batteries. The most common form of cadmium is found in Nickel-cadmium rechargeable batteries. The sale of Nickel-Cadmium batteries has been banned in the European Union except for medical use. The inhalation of cadmium can cause severe damage to the lungs and is also known to cause kidney damage. Cadmium is also associated with deficits in cognition, learning, behavior, and neuromotor skills in children.
5. Hexavalent chromium: A known carcinogen after occupational inhalation exposure.
6. Lead: Solder, CRT monitor glass, lead-acid batteries, some formulations of PVC. A typical 15-inch cathode ray tube may contain 1.5 pounds of lead, but other CRTs have been estimated as having up to 8 pounds of lead. Adverse effects of lead exposure

include impaired cognitive function, behavioral disturbances, attention deficits, hyperactivity, conduct problems and lower IQ.

7. Mercury: Found in fluorescent tubes (numerous applications), tilt switches (mechanical doorbells, thermostats), and flat screen monitors. Health effects include sensory impairment, dermatitis, memory loss, and muscle weakness. Exposure in-utero causes fetal deficits in motor function, attention and verbal domains. Environmental effects in animals include death, reduced fertility, and slower growth and development.

8. Perfluorooctanoic acid (PFOA): Found in Non-stick cookware (PTFE), used as an anti-static additive in industrial applications, and found in electronics. Studies have found increased maternal PFOA levels to be associated with an increased risk of spontaneous abortion (miscarriage) and stillbirth. Increased maternal levels of PFOA are also associated with decreases in mean gestational age (preterm birth), mean birth weight (low birth weight), mean birth length (small for gestational age), and mean APGAR score.

9. Sulphur: Found in lead-acid batteries. Health effects include liver damage, kidney damage, heart damage, eye and throat irritation. When released into the environment, it can create sulphuric acid.[8]

THE DANGER OF ELECTRONIC WASTE

When you look at a computer or cell phone, it doesn't seem to be dangerous. Typically, only the outer casing is visible, but it's what's inside that poses a threat to the environment, people and animals.

1. ON ENVIRONMENT

Electronic products are jam-packed with heavy metals, semi-metals and various chemical compounds that can leak into soil and water and become hazardous. Things like lead, mercury, copper, barium, nickel and even arsenic are all present within a variety of electronic products. As they're being thrown away or placed in the landfills, the products often break which can

[8] <https://www.disabled-world.com/health/ewaste.php> (data retrieved on 21st March, 2018)

expose the inner workings and those dangerous chemicals and metals. These percolate in the soil and get into the food chain.

When we throw out our computers, they wind up in landfills, causing the possibility of toxic metal leaching into the groundwater. Toxic metals in e-waste leach into our supply of resources, threatening their integrity. When e-waste is warmed up, toxic chemicals are released in to the air, damaging the atmosphere. E-waste management is a critical consideration for future generations as proper electronic recycling is becoming harder to find.[9]

Here are some of the main ways that different types of e-waste can negatively affect the planet and its inhabitants.

Air Pollution

Many rudimentary e-waste "processing plants" are not ethically run – or safe. For example, some e-waste traffickers burn open computer wires in order to get to the copper inside – a valuable commodity. The open burning can release hydrocarbons into the air, while the chemical stripping of gold-plated computer chips leads to emissions of brominated dioxins and heavy metals. A recent study of the environmental effects of the largest e-waste landfill in the world in Guiyu, China, found airborne dioxins to be 100 times more prevalent than previously measured.

Water Pollution

Cathode ray tubes, often found in older televisions, video cameras and computer monitors are often broken apart, the yoke removed and the shell dumped. Contents in the shell, such as lead and barium, could leach through the soil and into the ground water of local communities. This endangers not just the people who drink and bathe with this water but also the different species of wildlife that rely on the water to sustain.[10]

Soil Pollution

[9] <https://www.allgreenrecycling.com/effects-of-e-waste-on-our-environment/> (data retrieved on 24th March 2018).

[10] <https://eridirect.com/blog/2015/06/how-does-e-waste-affect-the-environment/> (data retrieved on 24th March, 2018).

Another study of the Guiyu landfill found wind patterns in Southeast China disperse toxic particles across the Pearl River Delta Region. The area, which contains a population of 45 million, is at-risk due to the toxins entering the "soil-crop-food pathway," which is one of the most common ways that heavy metals enter the human body.

2. ON HUMAN HEALTH

These metals and chemicals may not pose much of a risk in very small doses, because as they are taken in by the body, it works to get rid of them. However, if they are taken in faster than the body can dispose of them, they can be a big risk. Many of these chemicals and metals are known causes of serious health conditions like cancer, diabetes, impaired cognitive function, damaged organs and more.[11]

E-waste recycling has direct and indirect effects on human health conditions.

Direct impacts on human health may be caused by:

- Dust in indoor air generated in manual and mechanical dismantling processes (e.g. when processing plastics or CRT);
- Filter dust generated in the mechanical dismantling process;
- Noise emissions during the manual and mechanical dismantling process (conveyor belts, hammering, shredders etc.);
- Deviations from occupational safety standards;

Indirect impacts on human health may be caused by:

- Air pollution related to (HT) incineration (however the situation has been very much improved since waste gas purification systems are a common standard);
- Emissions due to transportation of materials;
- Contamination of water systems and soil near landfills.

[11] < http://www.cencalewaste.com/dangers-of-ewaste/> (data retrieved on 24th March, 2018).

The indirect impacts on human health are difficult to quantify, among others because of synergistic effects and the time-lag between exposure and reaction.[12]

E-Waste and health hazards

Lead : It exerts toxic effects on various systems in the body such as the central (organic affective syndrome) and peripheral nervous systems (motor neuropathy), the hemopoietic system (anemia), the genitourinary system (capable of causing damage to all parts of nephron) and the reproductive systems (male and female).

Mercury: It causes damage to the genitourinary system (tubular dysfunction), the central and peripheral nervous systems as well as the fetus. When inorganic mercury spreads out in the water, it is transformed into methylated mercury, which bio-accumulates in living organisms and concentrates through the food chain, particularly by fish.

Cadmium: It is a potentially long-term cumulative poison. Toxic cadmium compounds accumulate in the human body, especially in the kidneys. There is evidence of the role of cadmium and beryllium in carcinogenicity.

Polycyclic aromatic hydrocarbons (PAH): It affects lung, skin and bladder. Epidemiological studies in the past on occupational exposure to PAH provide sufficient evidence of the role of PAH in the induction of skin and lung cancers.

3. IMPACT ON CHILDREN

Children are particularly vulnerable to the health risks that might result from e-waste exposure and need more specific protection. While they are still growing, children's intake of water, air and food in proportion to their weight is significantly increased when compared with adults. The risk of hazardous chemical absorption is increased for children as well. In addition, children's bodies functional systems such as the:

1. Immune system
2. Digestive system

[12] <http://ewasteguide.info/impacts_of_e_waste_recycling_on_human_health> (data retrieved on 24th March, 2018).

3. Reproductive system
4. Central nervous system

These systems are still developing and exposure to toxic substances, by hampering further development, might cause damage that is irreversible. A number of children are exposed to e-waste derived in their daily lives due to unsafe recycling activities that are often times conducted at their own homes, either by family members, or by the children themselves. Children may be exposed through dump sites near their homes, play areas, or schools.[13]

Together with its collaborating partners, WHO is working at identifying the main sources and potential health risks of e-waste exposures and defining successful interventions. Initial support is being provided by the United States Environmental Protection Agency (US EPA), the United States' National Institute of Environmental Health Sciences (NIEHS) and the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. WHO has recently launched the E-Waste and Child Health Initiative aiming at protecting children and their families from detrimental health consequences due to e-waste.

4. IMPACT ON SITE WORKERS

E-waste is a global issue, particularly since a number of developing countries ship their discarded electronic equipment to less developed countries. In these countries, the e-waste is dismantled and then burned, producing toxic emissions which are harmful to waste site workers and communities that are nearby. An international population study, led by the University of Cincinnati (UC), examined the human developmental effects of environmental exposure to the complex metal mixture found in e-waste.[14]

Primitive recycling techniques; however, such as burning for retaining the inherent copper expose child and adult workers as well as their family members to a number of hazardous substances. E-waste-connected health risks might result from direct contact with harmful materials such as Lead, Cadmium, Chromium etc,. due to inhalation of toxic fumes, as well as from accumulation of chemicals in water, soil and food. Along with its hazardous components being processed, e-waste may give rise to several toxic by-products likely to affect human

[13] < http://www.who.int/ceh/risks/ewaste/en/> (data retrieved on 24th March, 2018).

[14] Supra note 5.

health. In addition, recycling activities such as the dismantling of electrical equipment may potentially present an increased risk of injury.

While the health implications of e-waste are difficult to isolate due to the informal working conditions, poverty, and poor sanitation, several studies in Guiyu, a city in southeastern China, offer insight. Guiyu is known as the largest e-waste recycling site in the world, and the city's residents exhibit substantial digestive, neurological, respiratory, and bone problems. For example, 80 percent of Guiyu's children experience respiratory ailments, and are especially at risk of lead poisoning.[3]

Residents of Guiyu are not the only ones at risk. Researchers such as Brett Robinson, a professor of soil and physical sciences at Lincoln University in New Zealand, warn that wind patterns in Southeast China disperse toxic particles released by open-air burning across the Pearl River Delta Region, home to 45 million people.[4] In this way, toxic chemicals from e-waste enter the "soil-crop-food pathway," one of the most significant routes for heavy metals' exposure to humans. These chemicals are not biodegradable—they persist in the environment for long periods of time, increasing exposure risk.[15]

POSITION IN INDIA

Studies so far reveal that the total e-waste generation in India is approximately 1,46,000 tonnes to 3.3 lakh tonnes a year and is expected to touch 4.7 lakh tonnes by 2011. Of the total e-waste generated in the country, western India accounts for the largest population at 35%, while the southern, northern and eastern regions account for 30, 21 and 14%, respectively. The top states in order of highest contribution to waste electrical and electronic equipment (WEEE) include Maharashtra, Andhra Pradesh, Tamil Nadu, Uttar Pradesh, West Bengal, Delhi, Karnataka, Gujarat, Madhya Pradesh and Punjab. The city-wise ranking of the largest WEEE generators is Mumbai, Delhi, Bangalore, Chennai, Kolkata, Ahmedabad, Hyderabad, Pune, Surat and Nagpur. [16]

Total WEEE generation in Maharashtra is 20,270.6 tonnes, of which Navi Mumbai contributes

[15] <http://www.prb.org/Publications/Articles/2013/e-waste.aspx> (data retrieved on 25th March, 2018)

[16] "E-waste hazard: The impending challenge", Indian Journal of Occupational and Environmental Medicine, August 2008, Available on <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2796756/> (data retrieved on 26th March, 2018)

646.48 tonnes, Greater Mumbai 11,017.06 tonnes, Pune 2584.21 tonnes and Pimpri-Chinchwad 1032.37 tonnes. An estimated 30,000 computers become obsolete every year from the IT industry in Bangalore alone.[17] Home to more than 1200 foreign and domestic technology firms, Bangalore figures prominently in the danger list of cities faced with e-waste hazard. As many as 1000 tonnes of plastics, 300 tonnes of lead, 0.23 tonnes of mercury, 43 tonnes of nickel and 350 tonnes of copper are annually generated in Bangalore. While on the basis of scrap handled by the Delhi-based scrap dealers, their total number of personal computers (PCs) meant for dismantling would be around 15,000 per year. This figure does not include PCs handled by large dealers who get scraps from foreign sources. Mumbai, the financial nerve-center of India, alone throws away 19,000 tonnes of electronic waste a month, excluding the large e-waste it imports from developed nations through its port. Besides the domestic e-waste generated, an additional 50,000 MT a year is illegally imported into the country. In a single month, there is a reported case of import of 30 MT of e-waste at the Ahmedabad port. [18]

While northern India is not a leading generator, it happens to be the leading processing center of e-waste in the country. There are only two formal recyclers in the south of India (at Chennai and Bangalore) and one in western India. Currently, there are no formal recyclers operating in the north or the east. Over 1 million poor people in India are involved in the manual recycling operations. Most of the people working in this recycling sector are the urban poor with very low literacy levels and hence very little awareness regarding the hazards of e-waste toxins. There are a sizeable number of women and children who are engaged in these activities and they are more vulnerable to the hazards of this waste. A comprehensive study is yet to be made of the health problems of women and children employed by the scrap dealers. [19]

LEGISLATION ON MANAGEMENT OF E-WASTE

[17]Beary H. Bangalore faces e-waste hazards. Available from: <http://www.news.bbc.co.uk/1/hi/world/south_asia/4222521.stm> (data retrieved on 26th March, 2018)

[18] *Scrapping the hi-tech myth: Computer waste in India*. Published in Toxics Link 01/02/2003. Available from: <http://www.toxicslink.org/pub-view.php?pubnum=37> (data retrieved on 26th March, 2018).

[19]E-waste posing health hazard. Available from: <http://www.hindu.com/2006/03/20stories/2006032019320300.htm> (data retrieved on 26th March, 2018).

During the last few years, various international calls for action have highlighted the need of strategic interventions in the field of e-waste. These include the Libreville Declaration emanating from the first Inter-Ministerial Conference on Health and Environment in Africa 2008, the Busan Pledge for Action on Children's Environmental Health of 2009 and the Strategic Approach to Integrated Chemical Management's expanded Global Plan of Action issued at the International Conference on Chemical Management ICCM3 in 2012. Currently, there are a number of international initiatives that are addressing global e-waste management and trade concerns, as well as issues with environmental pollution due to e-waste.

Together with its collaborating partners, WHO is working at identifying the main sources and potential health risks of e-waste exposures and defining successful interventions. Initial support is being provided by the United States Environmental Protection Agency (US EPA), the United States' National Institute of Environmental Health Sciences (NIEHS) and the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. WHO has recently launched the E-Waste and Child Health Initiative aiming at protecting children and their families from detrimental health consequences due to e-waste.

The Basel Convention started to address e-waste issues since 2002 which include, among others, environmentally sound management; prevention of illegal traffic to developing countries and; building capacity around the globe to better manage e-waste. The Mobile Phone Partnership Initiative (MPPI) was adopted by the sixth meeting of the Conference of the Parties to the Basel Convention.

The Nairobi Declaration on the Environmentally Sound Management of Electrical and Electronic Waste, 2006, IX/6 adopted by the ninth meeting of the Conference of the Parties (COP9) to the Basel Convention gave a mandate to the Secretariat to implement a work plan for the environmentally sound management of e-waste.[20]

The e-waste work plan adopted by COP9 included activities in the following work areas:

1. Programmes of activities for the environmentally sound management of e-waste in Africa, in Asia Pacific and in South America;

2. Partnership for Action on Computing Equipment (PACE)

[20] <*ewasteguide.info/files/UNEP_2006_NairobiDeclarationCRP24.pdf*> (data retrieved on 26th March, 2018)

3. Preparation of technical guidelines on transboundary movements of e-waste, in particular regarding the distinction between waste and non waste. [21]

E-WASTE RECYCLING LAWS IN THE UNITED STATES

The EPA reports that 142,000 computers and more than 416,000 mobile devices are discarded every day. In 2010, only 27% of e-waste in the U.S. was recycled, with mobile devices being the least recycled item at 11%.

There is currently no federal legislation in the U.S. that mandates the recycling of e-waste. Some states in the U.S. allow businesses and individuals to throw their used electronics in the trash; however, many states are beginning to mandate environmental responsibility by banning the disposal of e-waste into landfills.

Colorado recently became the 18th state to ban e-waste from entering landfills and incinerators and several states are working to pass new laws and improve existing laws.[22]

While the states that have adopted e-waste regulations should be commended, there is still room for improvement.

LEGAL SCENARIO IN INDIA

India, at present, generates about 400,000 tonnes of e-wastes annually of which only 19,000 tonnes are getting recycled according to the recent data by hardware manufacturers association, Mait.

According to Mait, around 40 per cent of the unused and obsolete electronic products sit idle at homes, godowns and warehouses as one does not know what to do with it or there is no systematic mechanism to dispose it.[23]

E-wastes are considered dangerous, as certain electronic components contain substances such as lead, cadmium, lead oxide (in cathode ray tubes), toxic gases, toxic metals, biologically

[21] <http://www.basel.int/Implementation/Ewaste/Overview/tabid/4063/Default.aspx> (data retrieved on 26th March, 2018).

[22]<http://www.e-cycle.com/e-waste-recycling-laws-in-the-united-states-and-stopping-the-export-of-e-waste-by-utilizing-e-stewards-certified-recyclers/> (data retrieved on 26th March, 2018).

[23]<http://www.business-standard.com/article/economy-policy/india-gets-first-e-waste-management-rules-111060900037_1.html> (data retrieved on 27th March, 2018).

active materials, acids, plastics and plastic additives. These substances are considered hazardous depending on their condition and density.[24]

Although there were legislations to regulate the disposal and management of E-waste in India, there was no proper implementation of these legislations.[25] The various legislations enacted by the Government of India so far are:-

1. The Hazardous Wastes (Management and Handling) Amendment Rules, 2003;
2. Guidelines for Environmentally Sound Management of E-waste, 2008;
3. The e-waste (Management and Handling) Rules, 2011;
4. E-waste (Management) Rules, 2016.

Following Supreme Court directions in the case of ***Research Foundation for Science, Technology and Natural Resource Policy Vs Union of India and Others, AIR 1995***, the states have notified a set of hazardous waste laws and built a number of hazardous waste disposal facilities in the last ten years. However, the CAG report found that over 75 per cent of state bodies were not implementing these laws.

THE E-WASTE (MANAGEMENT AND HANDLING) RULES, 2011.

1. Putting the onus of re-cycling of electronic wastes (e-waste) on the producers, the Ministry of Environment and Forest (MoEF) has for the first time notified e-waste management rules.
2. The e-Waste (Management and Handling) Rules, 2011 would recognize the producers' liability for recycling and reducing e-waste in the country. The rules came into effect from May 1, 2012.
3. Personal Computer manufacturers, mobile handset makers and white goods makers will be required to come up with e-waste collection centre's or introduce 'take back' systems.
4. Under the new rules, producers will have to make consumers aware about the hazardous components present in the product. Also, instructions for consumers for handling the equipment after its use along with the do's and don'ts. They will also have to give information booklets to prevent e-waste from being dropped in garbage bins.

[24] Ibid.

[25] <http://blog.ipleaders.in/e-waste-and-its-legal-implications-in-india/> (data retrieved on 28th March, 2018).

5. They also have to maintain records of e-wastes generated by them and make such records available with State Pollution Control Boards or the Pollution Control Committees.
6. The State Pollution Control Board will be required to prepare and submit to the Central Pollution Control Board (CPCB) an annual report (based on the data received by consumers) with regard to implementation of these rules, by September 30 of every year.

E-WASTE (MANAGEMENT) RULES, 2016

These rules were notified on 23rd March, 2016 and they shall come into force from the 1st day of October, 2016.[26] As per the Rules 'environmentally sound management of e-waste' means taking all steps required to ensure that e-waste is managed in a manner which shall protect health and environment against any adverse effects, which may result from such e-waste.

1. It applies to every manufacturer, producer, consumer, bulk consumer, collection centres, dealers, e-retailer, refurbisher, dismantler and recycler involved in manufacture, sale, transfer, purchase, collection, storage and processing of e-waste or electrical and electronic equipment listed in Schedule I, including their components, consumables, parts and spares which make the product operational.[27]
2. The Rules define 'e-waste' as 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[28]
3. The applicability of the rules has been extended to components, consumables, spares and parts of EEE in addition to equipment as listed in Schedule I.
4. Compact Fluorescent Lamp (CFL) and other mercury containing lamp have been brought under the purview of rules
5. Collection mechanism based approach has been adopted to include collection centre, collection point, take back system etc for collection of e-waste by Producers under Extended Producer Responsibility (EPR).

[26] <http://meity.gov.in/esdm/e-waste> (data retrieved on 28th March, 2018).

[27]<http://www.toxicswatch.org/2016/04/new-e-waste-management-rules-2016-to.html> (data retrieved on 28th March, 2018).

[28]<http://www.moef.gov.in/sites/default/files/EWM%20Rules%202016%20english%2023.03.2016.pdf> (data retrieved on 30th March, 2018).

6. Option has been given for setting up of PRO, e-waste exchange, e-retailer, Deposit Refund Scheme as additional channel for implementation of EPR by Producers to ensure efficient channelization of e-waste.
7. Collection and channelisation of e-waste in Extended Producer Responsibility - Authorisation shall be in line with the targets prescribed in Schedule III of the Rules. The phase wise Collection Target for e-waste, which can be either in number or Weight shall be 30% of the quantity of waste generation as indicated in EPR Plan during first two year of implementation of rules followed by 40% during third and fourth years, 50% during fifth and sixth years and 70% during seventh year onwards.
8. Deposit Refund Scheme has been introduced as an additional economic instrument wherein the producer charges an additional amount as a deposit at the time of sale of the electrical and electronic equipment and returns it to the consumer along with interest when the end-of life electrical and electronic equipment is returned.
9. The transportation of e-waste shall be carried out as per the manifest system whereby the transporter shall be required to carry a document (three copies) prepared by the sender, giving the details.
10. It does not apply to used lead acid batteries as covered under the Batteries (Management and Handling) Rules, 2001 made under the Act; micro enterprises as defined in the Micro, Small and Medium Enterprises Development Act, 2006 (27 of 2006); and radio-active wastes as covered under the provisions of the Atomic Energy Act, 1962 (33 of 1962) and rules made there under.
11. Clause 16 of the Rules provides "Every producer of electrical and electronic equipment and their components or consumables or parts or spares listed in Schedule I shall ensure that, new Electrical and Electronic Equipment and their components or consumables or parts or spares do not contain Lead, Mercury, Cadmium, Hexavalent Chromium, polybrominated biphenyls and polybrominated diphenyl ethers beyond a maximum concentration value of 0.1% by weight in homogenous materials for lead, mercury, hexavalent chromium, polybrominated biphenyls and polybrominated diphenyl ethers and of 0.01% by weight in homogenous materials for cadmium."[29]

[29] Ibid.

12. The roles of the State Government has been also introduced in the Rules in order to ensure safety, health and skill development of the workers involved in the dismantling and recycling operations.
13. Liability for damages caused to the environment or third party due to improper management of e-waste including provision for levying financial penalty for violation of provisions of the Rules has also been introduced.[30]
14. Urban Local Bodies (Municipal Committee/Council/Corporation) has been assign the duty to collect and channelized the orphan products to authorized dismantler or recycler.[31]

CONCLUSION

India is placed in a very interesting position. The need of the hour is an urgent approach to the e-waste hazard by technical and policy-level interventions, implementation and capacity building and increase in public awareness such that it can convert this challenge into an opportunity to show the world that India is ready to deal with future problems and can set global credible standards concerning environmental and occupational health.

The solution for the e-waste crisis lies in 'prevention at the manufacturing source' or the 'precautionary principle.' This can be done by employing waste minimization techniques and by a sustainable product design.

Policy-level interventions like: Clear definition of e-waste for regulation, Import and export regulatory regime, an integrated IT waste management policy etc should also be undertaken.

The current awareness regarding the existence and dangers of e-waste are extremely low, partly because the e-waste being generated is not as large as in developed countries. Urgent measures are required to address this issue.

The role of citizens in e-waste management include:

1. Donating electronics for reuse, which extends the lives of valuable products and keeps them out of the waste management system for a long time.

[30] <http://www.mait.com/assets/india-weee-rev---salient-features.pdf> (data retrieved on 28th March, 2018)

[31] "E-Waste (Management) Rules, 2016- What's New?" data available on <http://pib.nic.in/newsite/PrintRelease.aspx?relid=138319> (data retrieved on 28th March, 2018)

2. While buying electronic products, opting for those that are made with fewer toxic constituents, use recycled content, are energy efficient, are designed for easy upgrading or disassembly, use minimal packaging and offer leasing or take back options.
3. Building of consumer awareness through public awareness campaigns is a crucial point that can attribute to a new responsible kind of consumerism.

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