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## “UNCARED THREAT OF E-WASTE TO ENVIRONMENTAL EQUILIBRIUM - A SIN OF SCIENCE AND SILENCE”

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**Purpose:** To study the role of Government, society and people in understanding environment and managing the issues relating e-waste management.

**Methodology:** - Due to the fact that the life span of computers has dropped in developed countries from six years in 1997 to just two years in 2005, the amount of generated e-waste per year grows rapidly. Inappropriate methods like open burning, which are often used by the informal sector in developing countries to recover valuable materials, have heavy impacts on human health and the environment. Basing on this the research methodology used for the present research article is Doctrinal research method. As most of the information can be sought from the available literature by referring newspapers, books, articles, journals, websites etc., observing the reasons for the e-waste and how best it can be controlled

**Findings:** - E-waste is one of the fastest growing waste streams in developed as well as in developing countries. It is very difficult to understand the threat to the environment by the e-waste by ordinary layman. Hence the research is a kind of awareness to everyone to protect Globe.

**Research Limitations:-** Though responsibility cast upon everyone in maintain pollution free atmosphere the researcher concentrated more interpretation of Governmental powers and functions in managing E-waste related issues and to look into how an ordinary layman can be a part of protecting the Globe.

**Practical Implications:-** The results of this study would check the utility of role of state, and Judiciary in implementing and interpreting the values of protection of environment specially by managing E-waste and further protect the country because of the changes brought by such Environmental disasters which are affecting the society at large.

**Keywords:** - E-waste, UNIDO, UNEP, Legislation and Regulation



**Value:-**The study is probably first time conducted in systematic manner to check in the effective laws to maintain and to managing the environmental issues on E-WASTE especially in a developing country like India.

## ARTICLE

### **Introduction:**

Viewed through God's lens, there is no distinction between man and beast. But when we glance through man's lens, they are different. If a man thinks of other's hunger and pain, he is humane and so human, and when he does not think of others, he is beast. Of course, man is also an animal. When a person is totally divested of the humanity and human values, law is expected to reinforce the jurisprudence of 'Environmental protection.' Environment is always an envious ornament.

The world is advancing in technology and globe is reaping the fruits of advancement in technology. Due to the fact that the life span of computers has dropped in developed countries from six years in 1997 to just two years in 2005, the amount of generated e-waste per year grows rapidly, the amount of generated e-waste per year grows rapidly. But the same time mankind is facing problems of managing leftovers in the form of e-waste.

### **WHAT IS E-WASTE? :**

"Electronic waste" may be defined as discarded Electronic waste (Ex. Computers, office electronic equipment, entertainment device electronics, mobile phones, television sets and refrigerators). This definition includes use electronic which are destined for reuse, resale, salvage, recycling, or disposal. Others define the re-usable (working and repairable electronics) and secondary scrap (copper, steel, plastic, etc.) to be "commodities", and further the term "waste" for residue or material which is dumped by the buyer rather than recycled, including residue from reuse and recycling operations.

We observe that the high value of the computer recycling subset of electronic waste (laptops, desktops, and components like RAM working and reusable) can help pay the cost of transportation for a larger number of worthless pieces than can be achieved with display devices, which have less (or negative) scrap value. In A 2011 report, "Ghana E-Waste Country Assessment"<sup>1</sup> found that of 215,000 tons of electronics imported to Ghana, 30% were brand new and 70% were used. Of the used product, the study concluded that 15% was not reused and was scrapped or discarded.



By above we can say that E-waste is a term used to cover almost all types of electrical and electronic equipment (EEE) that has or could enter the waste stream. Although e-waste is a general term, it can be considered to cover TVs, computers, mobile phones, white goods (e.g. fridges, washing machines, dryers etc), home entertainment and stereo systems, toys, toasters, kettles – almost any household or business item with circuitry or electrical components with power or battery supply.

### EFFECTS OF E-WASTE ON HEALTH AND ENVIRONMENT:

There are various processes of dismantling and disposing of electronic waste in the third world which lead to a number of environmental impacts as illustrated in the graphic. Liquid and atmospheric releases end up in bodies of water, groundwater, soil and air and therefore in land and sea animals – both domesticated and wild, in crops eaten by both animals and human, and in drinking water.

### The environmental impact of the processing of different electronic waste components:

E-Waste Component	Process Used	Potential Environmental Hazard
Cathode ray tubes (used in TVs, computer monitors, ATM, video cameras, and more)	Breaking and removal of yoke, then dumping	Lead, barium and other heavy metals leaching into the ground water and release of toxic phosphor
Printed circuit board (image behind table - a thin plate on which chips and other electronic components are placed)	De-soldering and removal of computer chips; open burning and acid baths to remove final metals after chips are removed.	Air emissions as well as discharge into rivers of glass dust, tin, lead, brominated dioxin, beryllium cadmium, and mercury
Chips and other gold plated components	Chemical stripping using nitric and hydrochloric acid and burning of chips	A hydrocarbon, heavy metals, brominated substances discharged directly into rivers acidifying fish and flora. Tin and lead contamination of surface and groundwater. Air emissions of brominated dioxins, heavy metals and hydrocarbons
Plastics from printers, keyboards, monitors, etc.	Shredding and low temp melting to be reused	Emissions of brominated dioxins, heavy metals and hydrocarbons



Computer wires

Open burning and stripping to remove copper

Hydrocarbon ashes released into air, water and soil.<sup>1</sup>

### EFFECT ON HEALTH:

Below is the list of source from where e-waste is generated and chemicals, and its effects on human health as taken from:

Source of e-wastes	Constituent	Health effects
Solder in printed circuit boards, glass panels and gaskets in computer monitors	Lead (PB)	<ul style="list-style-type: none"> <li>Damage to central and peripheral nervous systems, blood systems and kidney damage.</li> <li>Affects brain development of children.</li> </ul>
Chip resistors and semiconductors	Cadmium (CD)	<ul style="list-style-type: none"> <li>Toxic irreversible effects on human health.</li> <li>Accumulates in kidney and liver.</li> <li>Causes neural damage.</li> <li>Teratogenic.</li> </ul>
Relays and switches, printed circuit boards	Mercury (Hg)	<ul style="list-style-type: none"> <li>Chronic damage to the brain.</li> <li>Respiratory and skin disorders due to bioaccumulation in fishes.</li> </ul>
Corrosion protection of untreated and galvanized steel plates, decorator or hardener for steel housings	Hexavalent chromium (Cr) VI	<ul style="list-style-type: none"> <li>Asthmatic bronchitis.</li> <li>DNA damage.</li> </ul>
Cabling and computer housing	Plastics including PVC	<p>Burning produces dioxin. It causes</p> <ul style="list-style-type: none"> <li>Reproductive and developmental problems;</li> <li>Immune system damage;</li> <li>Interfere with regulatory hormones</li> </ul>
Plastic housing of electronic equipments and circuit boards.	Brominated flame retardants (BFR)	<ul style="list-style-type: none"> <li>Disrupts endocrine system functions</li> </ul>

<sup>1</sup> Wath, S. B., Dutt, P. S., & Chakrabarti, T. (2011). E-Waste scenario in India, its management and implications. Environmental Monitoring and Assessment , 172, 249-262.



Front panel of CRTs	Barium (Ba)	Short term exposure causes: <ul style="list-style-type: none"><li>• Muscle weakness;</li><li>• Damage to heart, liver and spleen.</li></ul>
Motherboard	Beryllium (Be)	<ul style="list-style-type: none"><li>• Carcinogenic (lung cancer)</li><li>• Inhalation of fumes and dust. Causes chronic beryllium disease or beryllicosis.</li><li>• Skin diseases such as warts.</li></ul>

#### PROBLEMS FACED BY E-WASTE:

1. 80 to 85 percent of electronic products were discarded in landfills or incinerators, which can release certain toxics into the air.
2. E-waste represents 2 percent of America's trash in landfills, but it equals 70 percent of overall toxic waste. The extreme amount of lead in electronics alone causes damage in the central and peripheral nervous systems, the blood and the kidneys.
3. 20 to 50 million metric tons of e-waste are disposed worldwide every year.
4. Cell phones and other electronic items contain high amounts of precious metals like gold or silver. Americans dump phones containing over \$60 million in gold/silver every year.
5. Only 12.5 percent of e-waste is currently recycled.
6. For every 1 million cell phones that are recycled, 35,274 pounds of copper, 772 pounds of silver, 75 pounds of gold, and 33 pounds of palladium can be recovered.
7. Recycling 1 million laptops saves the energy equivalent to the electricity used by 3,657 U.S. homes in a year.
8. E-waste is still the fastest growing municipal waste stream in America, according to the EPA.
9. A large number of what is labeled as "e-waste" is actually not waste at all, but rather whole electronic equipment or parts that are readily marketable for reuse or can be recycled for materials recovery.
10. It takes 539 pounds of fossil fuel, 48 pounds of chemicals, and 1.5 tons of water to manufacture one computer and monitor
11. Electronic items that are considered to be hazardous include, but are not limited to:



- Televisions and computer monitors that contain cathode ray tubes
- LCD desktop monitors
- Laptop computers with LCD displays
- LCD televisions
- Plasma televisions

### **LAWS GOVERNING E-WASTE MANAGEMENT:**

The Basel Convention – The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was brought into force in 1992 in order to prevent the transportation of hazardous wastes to developing countries. Over 170 countries have now joined the convention, including Australia who became a member of the Basel Convention on the 5<sup>th</sup> February 1992.

The Basel Convention has three main objectives. Firstly it aims to minimize the generation of hazardous wastes and believes that through “cleaner production” both companies and the environment can benefit through lower costs and less environmental damage. Secondly it encourages countries and manufacturers to treat and dispose of hazardous wastes as close to their source of generation as possible. They hope that this will reduce the risk of accidents and spills like the one mentioned above and also to ensure that the cost of disposal remains the responsibility of its generators. Finally, and most crucially, The Basel Convention hopes to minimize the movement of hazardous waste across borders and overseas by enforcing an agreed regime of rules and licenses. Parties to the Basel Convention have agreed not to export any hazardous waste unless proper licenses have been acquired.

The Basel Convention identifies 27 specific categories of waste; some of the most hazardous chemicals addressed by the convention are arsenic, cadmium, lead, mercury and PCB's – all of which are found in our household electronic waste. When we send our e-waste overseas, not only are we running the risk of spilling deadly chemicals into the ocean, but we are also sending it to countries that lack the financial and technical capabilities to dispose of this kind of waste.

In 1995, Annex VII was added to the convention which stated that members “shall not export hazardous wastes intended for recovery, recycling or final disposal” in order to protect developing countries that lacked “financial, technical, legal and institutional capacity” to dispose of this waste safely. Recycling electronic waste without the correct safety procedures and equipment can cause



immediate damage to the workers through inhaling fumes and direct contact with hazardous chemicals. Alternatively, the waste is sent directly to landfill allowing these chemicals to seep into the earth, infecting water streams and soil. This Greenpeace video highlights the dangers that hazardous waste, particularly e-waste, pose to countries who just don't have the facilities to dispose of it, or the powers to stop it arriving by the container load.

Whilst the Basel Convention and its parties do everything in their power to try and stop such damaging transportation of hazardous materials, it is still happening today. Rogue traders continue to try and con customs by diluting chemicals or mixing them with less hazardous materials. It is for this reason that the Basel Convention is so crucial in ensuring that this does not continue to happen by helping governments draft and implement legislation and punishments that combat illegal trafficking.

At 1800Ewaste we only use recycling facilities within Australia where electronic waste and the dangerous chemicals it contains can be recycled in a controlled environment to ISO14001 standard. 1800ewaste is Australia's leading e-waste collection and recycling service and we're passionate about diverting as much electronic equipment from landfill as possible. We believe in prolonging the lifespan of valuable materials by recycling all that we can. Currently 95-98%, by weight, of all the materials we collect is recycled for future use. Our service is professional, fast and reliable; we'll come to you, collect your E-waste and deliver it to the appropriate recycling facility.

### **INDIAN SCENARIO:**

E-waste management assumes greater significance not only due to the generation of our own waste but also dumping of e-waste from the developed countries. Rag pickers and waste dealers found it easy to adapt to the new waste stream, resulting in a large number of new business focusing on the reuse of components or extraction of secondary raw materials. Some of the recycling processes are extremely harmful and have negative impacts on the workers' health and environment.

### **STATUS OF E-WASTE MANAGEMENT IN INDIA:**

Despite a wide range of environmental legislation in India there are no specific laws or guidelines for electronic waste or computer waste. As per the Hazardous Waste Rules (1989), e-waste is not treated as hazardous unless proved to have higher concentration of certain substances. Though PCBs and CRTs would always exceed these parameters, there are several grey areas that need to be addressed. Basel Convention has Waste electronic assemblies in A1180 and mirror entry in B1110, mainly on concerns of mercury, lead



and cadmium. Electronic waste is included under List-A and List-B of Schedule-3 of the Hazardous Wastes (Management & Handling) Rules, 1989 as amended in 2000 & 2003. The import of this waste therefore requires specific permission of the Ministry of Environment and Forests. As the collection and re-cycling of electronic wastes is being done by the informal sector in the country at present, the Government has taken the following action/steps to enhance awareness about environmentally sound management of electronic waste (CII, 2006):

- Several Workshops on Electronic Waste Management was organized by the Central Pollution Control Board (CPCB) in collaboration with Toxics Link, CII etc.

- Action has been initiated by CPCB for rapid assessment of the E-Waste generated in major cities of the country.

- A National Working Group has been constituted for formulating a strategy for E-Waste management.

- A comprehensive technical guide on "Environmental Management for Information Technology Industry in India" has been published and circulated widely by the Department of Information Technology (DIT), Ministry of Communication and Information Technology.

- Demonstration projects have also been set up by the DIT at the Indian Telephone Industries for recovery of copper from Printed Circuit Boards. Although awareness and readiness for implementing improvements is increasing rapidly, the major obstacles to manage the e wastes safely and effectively remain. These include

- The lack of reliable data that poses a challenge to policy makers wishing to design an e-waste management strategy and to an industry wishing to make rational investment decisions.

- Only a fraction of the e waste (estimated 10%) finds its way to recyclers due to absence of an efficient take back scheme for consumers,

- The lack of a safe e waste recycling infrastructure in the formal sector and thus reliance on the capacities of the informal sector pose severe risks to the environment and human health.

- The existing e waste recycling systems are purely business-driven that have come about without any government intervention. Any development in these e waste sectors will have to be built on the existing set-up as the waste collection and pre-processing can be handled efficiently by the informal sector, at the same time offer numerous job opportunities.

The Swiss State Secretariat for Economic Affairs mandated the Swiss Federal Laboratories for Materials Testing and Research (EMPA) to implement the programme "Knowledge Partnerships in e-Waste





Recycling" and India is one of the partner countries. The programme aims at improving e-waste management systems through Knowledge Management and Capacity Building. It has analyzed e-waste recycling frameworks and processes in different parts of the world (Switzerland, India, China, South Africa) in its first phase (2003-04) and all results of the project are documented on

### **WASTE MANAGEMENT STRATEGIES:**

The best option for dealing with E wastes is to reduce the volume. Designers should ensure that the product is built for re-use, repair and/or upgradeability. Stress should be laid on use of less toxic, easily recoverable and recyclable materials which can be taken back for refurbishment, remanufacturing, disassembly and reuse. Recycling and reuse of material are the next level of potential options to reduce e-waste. Recovery of metals, plastic, glass and other materials reduces the magnitude of e-waste.

These options have a potential to conserve the energy and keep the environment free of toxic material that would otherwise have been released. It is high time the manufactures, consumers, regulators, municipal authorities, state governments, and policy makers take up the matter seriously so that the different critical elements depicted in Figure 1 are addressed in an integrated manner. It is the need of the hour to have an “e waste-policy” and national regulatory frame work for promotion of such activities. An e Waste Policy is best created by those who understand the issues. So it is best for industry to initiate policy formation collectively, but with user involvement. Sustainability of e-waste management systems has to be ensured by improving the effectiveness of collection and recycling systems (e.g., public-private-partnerships in setting up buy-back or drop-off centers) and by designing-in additional funding e.g., advance recycling fees.

E-waste policy and regulation The Policy shall address all issues ranging from production and trade to final disposal, including technology transfers for the recycling of electronic waste. Clear regulatory instruments, adequate to control both legal and illegal exports and imports of e-wastes and ensuring their environmentally sound management should be in place. There is also a need to address the loop holes in the prevailing legal frame work to ensure that e – wastes from developed countries are not reaching the country for disposal. The Port and the Custom authorities need to monitor these aspects. The regulations should prohibit the disposal of e wastes in municipal landfills and encourage owners and generators of e-wastes to properly recycle the wastes. Manufactures of products must be made financially, physically and legally responsible for their products, policies.

### **CONCLUSION:**

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In summary one can clearly grasp and understand the e-waste problem is of global concern because of the nature of production and disposal of waste in a globalized world. Although it is difficult to quantify global e-waste amounts, we do know that large amounts are ending up in places where processing occurs at a very rudimentary level. This raises concerns about resource efficiency and also the immediate concerns of the dangers to humans and the environment.

To ensure safe and environmental friendly recycling and disposal of e-waste following are some suggestions and recommendations:.

- 1. Proper collection of e-waste:** There should be proper collection of e-waste for recycling. It should be directly collected by recyclers or their agents.
- 2. Improve the quality of electric or electrical appliances** The producers of electronic or electrical device should improve the quality of their products. Age of Computer reduces 3-5 year from 7 year.
- 3. Impose penalty:** Government should impose a heavy penalty on those who do not follow the prescribed method or procedure for discarding e-waste.
- 4. Organize Awareness campaigns:** The central as well as state government should organize awareness campaign to enlighten the citizen about the harms of improper e-waste disposal.
- 5. Attract investment in this sector:** The government must provide subsidies to the recycler and thus encourage the private banking sector to invest in it.
- 6. Improve environmentally sound recycling infrastructure:** The recycler should stop traditional method of recycling the e-waste like incineration, landfill etc and adopt sound, ecology friendly techniques and sound infrastructure for recycling.
- 7. Ban on import:** There should be total ban on importing e-waste. The government is planning to Ban the imports of used computers and e-waste. Even though there is a conflict between the Finance Ministry which wants the ban and the Commerce ministry which is against the ban since in their opinion commerce will suffer as a result of the ban
- 8. Amend the domestic rules and laws relating to e-waste:** The government should make existing laws more rigid so that the developed countries cannot dump their e-waste in our country.
- 9. Tie recycling in with take back product responsibility:** There should be an agreement among the seller, buyer and recycler of any electronic or electric products. There should



be tri party agreement in which everyone has a liability towards other, it means that buyer should give back the product to the seller when products become obsolete or old and then the seller should give such products to the recycler.

- 10. Low cost technology:** India as a developing country needs simpler cost technology keeping view of maximum resource recovery in an environmental friendly methodology.

“Nature shrinks as capital grows. The growth of the market cannot solve the very crisis it creates.”

— Vandana Shiva,

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