E-Waste Management

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***Abstract*—The electronic business is the world's biggest and quickest developing assembling industry on the planet. Disposed of electronic and electrical hardware with the majority of their peripherals toward the finish of life is named e-waste. This investigation intends to exhibit that the present worldwide e-waste situations and well-being perils could drag out the accomplishment of manageable improvement targets. This investigation represents situations from alternate points of view and raises worries about e-waste, distinguishes data holes, and gives a premise to learning and mindfulness building and innovative change to encourage worldwide long haul maintainable improvement. E-waste is significant hotspot for auxiliary crude material yet unsafe if regarded and disposed of despicably as it contains numerous poisonous segments, for example, lead, cadmium, mercury, polychlorinated biphenyl and so on. The nearness of lead, mercury, arsenic, cadmium, selenium and hexavalent chromium and fire retardants past edge amounts in e-waste groups them as hazardous waste. The real bit of the e-waste created locally and also illicitly foreign are reused in unrefined way prompting contamination of the earth. Absence of enactment in our nation at exhibit is helping this dangerous type of reusing. In this manner there is pressing need to casing and execute rules for directing this waste and to discover earth sound, monetarily reasonable strategies for reusing and discarding this vital malice. The need of ecologically stable administration of e-waste is carried out with the assistance of a contextual analysis of uncontrolled dumping of e-waste.41.8 million tonnes of e-waste are being produced annually. The e-waste is being sent to the countries like India, Ghana, and China to recycle.**

Keywords—E-waste, production and generation, developing countries, health impact, management, sustainability, hazardous waste, e-waste handling, e-waste transportation.

I. INTRODUCTION

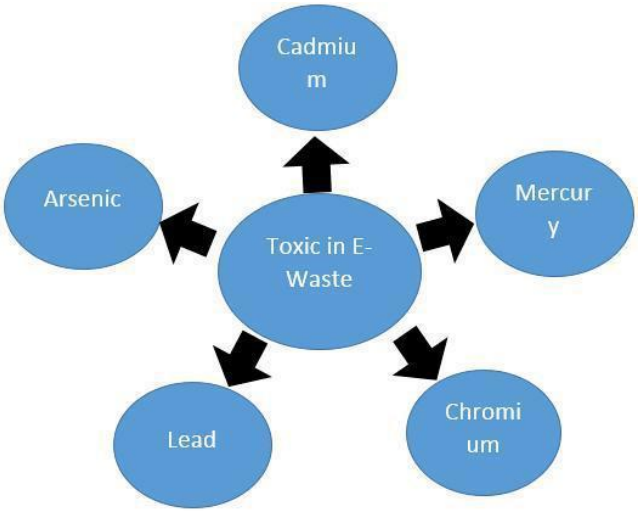
Pollution is a major problem facing in current situation. Every human being is been responsible for the pollution. The technology development has increased and at the same time our natural environment gets affected. In this current generation everyone has electronic gadgets in their home; Electronic gadgets are meant to make our lives happier and simpler, but they contain toxic substances, their disposal and recycling becomes a health nightmare. It has penetrated every aspect of our lives and most of us do not think about what happens to these gadgets when we discard or upgrade. This new kind of waste is posing a serious challenge in disposal and recycling to both developed and developing countries. While having some of the world's most advanced high-tech software and hardware developing facilities, India's recycling sector can be called medieval. For example, Television,

Mobile phone and Personnel Computer screens regularly contain perilous materials, for example, lead, mercury, and cadmium, while nickel, beryllium, and zinc can frequently be found in circuit sheets. Because of the nearness of these substances, reusing and transfer of e-waste turns into a vital issue.

Many people are unconscious of the potential contrary effect of the quickly expanding utilization of PCs, mobiles, and TVs. At one point these items are put in landfills and buried or burned, they posture wellbeing dangers because of the dangerous materials they contain. The dishonorable transfer of electronic items prompts the likelihood of harming the earth. As more e-waste is set in landfills, introduction to ecological poisons is probably going to increment, bringing about lifted dangers of disease and formative and neurological issue.

II. COMPOSITION OF E-WASTE

E-squander ordinarily contains significant and possibly dangerous materials. The arrangement of e-squander depends emphatically on components, for example, the kind of electronic gadget, the model, maker, date of fabricate, and the age of the piece. Scrap from IT and media transmission frameworks contain a higher measure of valuable metals than scrap from family unit machines. For example, a cell phone contains more than 40 components, base metals, for example, copper (Cu) and tin (Sn); unique metals, for example, lithium (Li) cobalt (Co), indium (In), and antimony (Sb); and valuable metals, for example, silver (Ag), gold (Au), and palladium (Pd). Exceptional treatment of e-waste ought to be considered to counteract squandering significant materials and uncommon components. Materials, for example, gold and palladium can be mined all the more successfully from e-squander contrasted with mining from mineral. By differentiate e-squander contains PBDEs, which are fire retardants that are blended into plastics and different parts. Circuit sheets found in the greater part of the electronic gadgets may contain arsenic (As), cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg), and other poisonous chemicals. Normal printed circuit sheets treated with lead patch in electronic gadgets contain roughly 50 g of tin-lead bind per square meter of circuit board. Old iceboxes, coolers, and aerating and cooling units contain ozone exhausting Chlorofluorocarbons (CFCs). The conspicuous materials, for example, barium, cadmium, copper, lead, zinc, and other uncommon earth metals are contained in end-of-life (EOL) cathode beam tubes (CRTs) in PC screens, and TVs. For instance, things, for example, leaded glass give assurance against X-beams created in the photo projection process in CRTs. The normal lead in CTR screens is 1.6-3.2 kg. In this way, the US and other created nations in the EU and Japan have restricted the transfer of cathode beam tubes in landfills due to their poisonous attributes. A basic test in outlining and creating techniques to oversee e-squander is the changing organization of the numerous constituents due the headway of innovation, especially in the electronic segments. It is against this foundation that e-squander reusing and transfer techniques should keep pace with the changing structure of e-squander.



Pollutant	Occurrence
Liquid crystal	Displays
Lithium	Mobiles,Telephones,Photographicequipments, video equipments, batteries etc.
Mercury	Components of Copper machines and steam irons, batteries in clocks and pocket calculators, switches, LCDs
Nickel	Alloys, batteries, relays, semiconductors, pigments
PCBs (poly chlorinated biphenyls)	Transformers, capacitors, softening agents for paints, glue, plastic
Selenium	Photoelectric cells, pigments, photo copiers, fax Machines
Silver	Capacitors, Switches (contacts) batteries, resistors
Zinc	Steel, brass, alloys, disposable and rechargeable batteries, luminous substances
Arsenic	Semiconductors, diodes, microwaves, LEDs (light emitting diodes), solar cells
Barium	Electron tubes, filler of plastic and rubber, lubricant additives
Lead	Lead reachable batteries, solar, transistors, lithium batteries, PVC (polyvinyl chloride), stabilizers, lasers, LEDs, thermo electrical elements, circuit Boards
Cadmium	Batteries, pigments, solders, alloys, circuit boards, computer batteries, monitor, cathode ray tubes (CRTs)
Chrome	Dyes/ Pigments, Switches, Solar panels

III. SIGNIFICANCE OF E-WASTE

Electronic waste (or e-waste) is the fastest growing waste stream, and its disposal is a major environmental concern in all parts of the world. More than 50 million tons of e-waste is generated every year with major fraction finding its way to landfills and dumpsites. E-waste comprises as much as 8% of the municipal solid waste stream in rich nations, such as those in GCC. Globally only 15 – 20 percent of e-waste is recycled while the rest is dumped into developing countries. However, in the Middle East, merely 5 percent of e-waste is sent to recycling facilities (which are located in Asia, Africa and South America) while the rest ends up in landfills.

IV. E-WASTE MANAGEMENT IN WORLD

One theory is that increased regulation of electronic wastes and concern over the environmental harm in nature economies creates an economic disincentive to remove residues prior to export. Critics of trade in used electronics maintain that it is still too easy for brokers calling themselves recyclers to export unscreened electronic waste to developing countries, such as China, India and parts of Africa, thus avoiding the expense of removing items like bad cathode ray tubes (the processing of which is expensive and difficult). The developing countries have become toxic dump yards of e-waste. Proponents of international trade point to the success of fair trade programs in other industries, where cooperation has led to creation of sustainable jobs and can bring affordable technology in countries where repair and reuse rates are higher.

South Korea, Taiwan, and southern China all excelled in finding "retained value" in used goods, and in some cases have set up billion-dollar industries in refurbishing used ink cartridges, single-use cameras, and working CRTs. Refurbishing has traditionally been a threat to established manufacturing, and simple protectionism explains some criticism of the trade. Works like "The Waste Makers" by Vance Packard explain some of the criticism of exports of working product, for example, the ban on import of tested working Pentium 4 laptops to China, or the bans on export of used surplus working electronics by Japan.

- Exported (1.5 million tons),
- Recycled under non-compliant conditions in Europe(3.15 million tons),
- Scavenged for valuable parts (750,000 tons) or simply thrown in waste bins (750,000 tons).

V. THE ENVIRONMENTAL CONCERN

European and American companies since the 1980's have been disposing their electronic waste by shipping them to other countries such as China and India.

Initially this seemed like an easy solution to the growing "waste" problem in our own domestic landfills. However, this was not the case.

Environmentalists, upon further investigation, learned that these countries were improperly handling e- waste. They were processing components in very crude, inhumane, and destructive ways.

The E-waste also affects human life by affecting the lungs, brains, skins during improper recycling of e-waste.

VI. RECYCKING OF E-WASTE WORLD WIDE

E-waste generated from the different diverse sources is normally collected as a whole unit or sub-unit of functional equipment. In many instances across the globe, whole units of e-waste have been categorized as e-waste. Based on the number of discarded information communication technology (ICT) devices collected in Europe, computers, cell phones, fixed-line telephones, televisions, and radios are the major electronic products, and together they amounted to 11.7 million tons in 2007. In 2004, approximately 75,000 tons of WEEE were collected, classified, disassembled, and then processed in Switzerland, compared with the collection of approximately 68,000 tons in 2003.

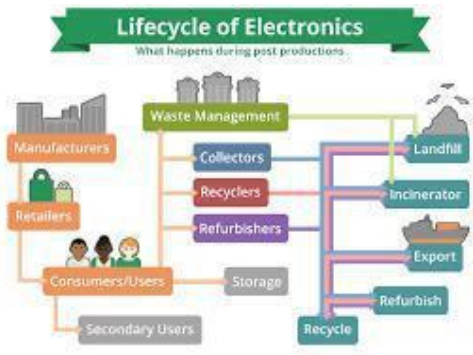
In developing and transition countries, little consideration is given to the quantification of the e-waste collected. The reason is that in pre-reprocessing stages, collection of the e-waste is mostly undertaken by the unorganized sector of scrap dealers/traders or peddlers. As a result, this information is invisible to the statistics collection system, which makes quantification of e-waste very difficult in developing and transition countries.

The scientific and environment friendly disposal of e-waste is critical. Relevant past studies on e-waste management confirmed that rapid growth combined with rapid product obsolescence are the most important factors making discarded e-products one the fastest growing waste fraction, accounting for 8% of all municipal waste in the EU. If not disposed of properly it could lead to significant negative environmental impacts. The average for developing and transition countries was 1% of total solid waste, which increased to 2% in 2010. Developing and transition countries, especially those in Africa and Asia, are the primary destinations for e-waste dumping, despite these countries lacking basic disposal technologies or facilities.

A relevant case-study on e-waste management pointed out that it is not possible to make an overall comparison between different countries, even if they are in the same continent, as the definitions in legislation and categorization of e-waste streams differ. Nevertheless, it is established that the main volumes of e-waste reside in developed countries.

VII. COLLECTION, TREATMENT AND DISPOSAL SYSTEMS

Collection, treatment, and disposal systems are critical elements of e-waste management. Most developed countries have framed conventions, directives, and laws aimed at fostering proper collection, treatment, and recycling of e-waste, as well as safe disposal of the non-recyclable components. These include the EPR, product stewardship, advance recycling fund (ARF), the 3Rs or Reduce, Reuse, Recycle initiative, etc. For the EU, two directives have been promulgated to place an obligation on the producers of e-goods to take back EOL or waste products free of charge in an effort to reduce the amount of waste going to landfills. However, in developing and transition countries, e-waste is treated in backyard operations, using open sky incineration, cyanide leaching, and simple smelters to recover precious metals mainly copper, gold, and silver— with comparatively low yields—and discarding the rest with municipal solid waste at open dumps, into surface water bodies and at unlined and unmonitored landfills, thereby causing adverse environmental and health effects. Disposal of e-waste is mainly through landfilling. Most often, the discarded electronic goods finally end-up in landfill sites along with other municipal waste or are openly burnt releasing toxic and carcinogenic substances into the atmosphere. In developing and transition countries the disposal of e-waste in the informal sector is very rudimentary so far as the safe techniques employed and practices are concerned, resulting in low recovery of materials. In Developing countries the disposal system is burning and dumping in open sites, but in Developed Countries the disposal system is Landfill Disposal and Incineration with MSW. E-waste management is different between developed countries and developing and transition countries. Developing and transition countries do not have guidelines and information campaigns on the fate of e-waste. Especially, less sophisticated disposal systems are used, from open burning and dumping to uncontrolled landfill sites, which pose significant environmental pollution and occupational exposure to e-waste-derived chemicals. Serious challenges in the disposal of e-waste were analyzed across developing countries such as Brazil, China, and India outlining the difficulty to implement/enforce existing regulations and clean technologies backed by lack of capacity building and awareness. In contrast, developed countries have devised sophisticated disposal schemes and high-cost systems, which are less hazardous to handle waste. However, a comprehensive overview of the situation is constrained by the availability of data. This means that the differences in the socio-economic and legal contexts between typical developing and developed countries' scenarios limit e-waste management in developing and transition countries. The regulations that guide the disposition of e-waste in developing countries is mostly fragmented and lack monitoring, while in developed countries the regulations are stringent and there is effective monitoring.



VIII. E-WASTE MANAGEMENT IN INDIA

India is the fifth greatest maker of E-waste on the planet; disposing of 1.7 million tons (Mt) of electronic and electrical gear in 2014. In India E-waste gathering, transportation, isolation, destroying, reusing and transfer is done physically by untrained works in casual part. Because of low mindfulness and refinement e-squander is tossed along with waste which is gathered and isolated by cloth pickers. E-waste contains reusable and valuable material. Cloth pickers offer this E-waste to scrap merchants and run their employment. The piece merchants supply the E-waste to reusing enterprises. Computer devices account for nearly 70% of e-waste, with the contribution of telecom sector being 12%, medical equipment being 8%, and electric equipment's being 7% of the annual e-waste production. The Government, public sector companies, and private sector companies generate nearly 75% of electronic waste; with the contribution of individual household being only 16%. City-wise, Mumbai tops the list in producing electronic
waste, followed by New, Bangalore and Chennai. State-wise Maharashtra ranks first in generation of electronic waste, followed by Tamil Nadu and Uttar Pradesh. Electronic waste account for 40% of lead and 70%of heavy metals found in landfills. These pollutants are responsible for groundwater contamination, air pollution and soil acidification. The Ministry of Environment, Forest and Climate Change has notified E-Waste (Management) Rules, 2016. The rules - for the first time in India introduced Extended Producer (EPR). EPR stipulates for collection 30% waste in first two years and up to 70% in seven years. According to ASSOCHAM, an industrial body in India the, Compound Annual Growth Rate (CAGR) of electronic waste is 30%. Nearly 95% of processing of electronic waste is carried out by the unskilled informal sectors.

have' and there can be a lot of peer pressure to have the latest device. But often this doesn't take into account the practical use of the device. Always chasing the latest technology is a never-ending quest – there will always be a new product or an upgrade. Think about whether you really need the additional options on a new device. Look at what you use your current device for and if it still suits your needs. You might also consider how all your electronic devices fit together. Also consider you usage of the device as part of your lifestyle.

Extend Use:- You can extend the life of your electronic device in several ways. Make sure you that look after it. Buying a case for your laptop or tablet helps to protect it from bumps and scrapes, while screen protectors can minimize the risks of cracking or damaging the screen of a computer, tablet of smartphone. One of the most common ways in which devices are damaged is regular overcharging of the battery. When you battery is full, unplug the device so it is not being continually supplied with power (this also helps reduce electricity usage). The other thing to consider to extend the use of devices is get software and memory upgrades. Often new versions boast of increased memory, programs or apps, but often these can be amended to an existing device.

Re-Use:- If you have decided to get a new device, think about who may benefit from receiving your old one. Charitable organizations, schools, friends and family members may be grateful to receive a donation of electronic equipment (just make sure you take any personal information off your device first). If you don't know of someone in your immediate circle that would like the device, consider 'free-cycling'. Many towns and cities have online forums for people to offer unwanted items for free to those who want them. This is a great wayof circumventing traditional monetary economies.

IX. STEPS TO CONTROL E-WASTE IN CURRENT SCENARIO

1) Design life of Electronic products can be increased tocertain period in order to minimal the E waste generation.
2) Incineration plants for E waste should be provided, as in developed countries incineration plants are used similarly in developing countries the same system should be followed, the amount of heat generated can be used for electricity generation. As large amount of heat is generated in incineration plant which in turn can be used for producing steam.
3) Toxic elements such as mercury and lead should be tested and eliminated; lead containers can be used to store lead elements.
4) The waste should be properly burned and the ashes then can be dumped into the landfill sites, direct dumping of waste in landfill without burning causes soil pollution, leaching, ground water contamination, blue baby syndrome etc.
5) Have the outdated component of an electronic product refurbished or upgraded instead of buying an entirely new replacement.
6) Never throw unwanted electronics along with ordinary trash. Pass them on to relatives and friends in need for reuse.
7) Reduce:- The first thing is to consider whether you really need a new device. Products are often marketed as 'must
8) Recycle:- Many of the components and materials in electronic devices can be recycled, such as the metal in wiring and circuit boards. By recycling minimize e waste your e-waste you ensure that any usable material is extracted for another purpose, so reducing

the use of raw materials, saving resources that would go into manufacturing new products – including water and manpower – and preventing dangerous chemicals going into landfill. Many local authorities have dedicated schemes for recycling e-waste, so check with your local council. Sometimes manufacturers themselves have schemes to take back unwanted devices for recycling.

X. 8 WAYS FOR MANAGING E-WASTE

1. Buy less:- Buying things we simply do not need is probably the biggest cause of e-waste. We need to stop (really, STOP) and ask ourselves if we even need a gadget or electronic item BEFORE we buy it.
2. Organize what we have:- If we don't organize your gadgets, wires, connectors and DVDs, we never really know what we have. The last thing we want is to buy something you think we need it, only to find a duplicate buried in your cabinet.
3. Give away or donate e-waste:- If we don't need a thing, donate it so someone else can use it. Donations are great for tax deductions; often the amount will be close to the value of the item if you tried to sell it.
4. Take them back to the store:- A few stores have a buy-back program. Before we purchase a new gadget at a store, ask the store if they'll buy back our old camera, laptop, or any other electronic. Best Buy has a trade-in option, where we can get rid of your old equipment in exchange.
5. Sell:- We can sell our electronic items as soon as you don't need them; they lose value rapidly when newer models come on the market.
6. Learn about our local recycling options:- We have to know about any recycling units nearby to recycle our e-waste instead of throwing in garbage.
7. Think ahead:-We have to think ahead if any of our electronic devices are been fault for first time we have think if it is need or to sell.
8. Educate yourself, and be a little afraid:- Most electronic gadgets have toxic materials in them, so it is extremely important to dispose of them the right way. Educate yourself, your kids, and your friends. These toxins should push us to be more mindful of e-waste.

XI. CONCLUSION

The quantum of wastes generated over the past several years have posed an ever increasing threat to environment and public health. As far as e-waste is concerned, it has emerged as one of the fastest growing waste streams worldwide today. Most developed nations in the world have laws and regulations requiring that e-waste not be disposed of in landfills or be incinerated. Many people do not understand that the parts in old devices can be reused in new products. There is a popular mantra used by many recycling advocates, "Reduce, Reuse, and Recycle." This slogan has widely been promoted with plastics and glass, but its message is also applicable to the disposal of e-waste. Many electronic stores offer services to help customers bring in old electronics or parts so as to dispose of them safely and properly. Many developed countries have enacted laws to prevent this from happening, but e-waste is still often being exported. Tons and tons of e-waste is dumped each year and the problems continues to grow. 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. Let's take a step to prevent the world from Electronic wastes.

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