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A Study on Electronic Waste Management in India

Harshit Srivastava[1], Harshit Wahal[2], Hrithik Roy[3], Dr. Brajesh Kumar[4]
Under Graduate Students, School of Business, Galgotias University, Greater Noida, U.P, INDIA.

Abstract: ***In the electronic industry, e-scraps or e-wastes refer to electronic goods that are discarded or unneeded. About 50 million ton of e-wastes are produced every year. Depending on their reactions, there might be potential danger. E-wastes, such as computer batteries and other electrochemical waste, may cause unwanted results, so it is important to consider them along with physical wastes. India generates about 1.5 lakh tons of e-waste annually, and almost all of it ends up in the informal sector as there is no organized alternative.***

It is well documented that humanity's capabilities were enhanced by the industrial revolution. However, the revolutionary changes experience by societies across the globe due to the application of electronics are deeper and more widespread than the impact of the industrial revolution.

Human society has been profoundly changed by the electronics age and has become more connected than ever before. Electronic items have contributed to smoother communication, economic growth, and job opportunities.

However, in addition to the positives, technology has brought to light a number of concerns, such as the growing problem of e-waste, which society must confront head on. In the existing situation, it is always possible that human health and the environment would be in trouble. If coordinated legislation and activities for efficient e-waste management and disposal were not enacted.

This paper aims to provide a quick overview of the relatively new notion of e-waste, its production in India, and the associated environmental and health implications. It emphasizes the booming informal and nascent official e-waste recycling economies, as well as the urgent need for more explicit legislation and a forward-looking strategy. The paper also examines global e-waste trading and international experience in this area. There is also a list of references at the conclusion for further reading. Each year, hundreds of thousands of consumer electronics, computers, monitors, phones, printers, televisions and other portable devices become outdated and were mainly dumped to the landfills or poorly recycled. Recent technological development and growing demands for new and better functioning electronics accelerate the amount of electronic waste (e-waste) worldwide, making it to be one of the fastest growing streams in many countries. The estimated lifespan of electronics is about three to five years because of the increasing rates of consumption, new developments and urbanization.

Keywords: E-waste, E-waste management, Danger of e-waste, Effect of e-waste

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I owe my deep gratitude to my supervisor guide Prof. **Dr. BRAJESH KUMAR** who took keen interest on my project work and guided me all along. I have learned a lot during the duration of this research project and I hope you will find my working interesting and knowledge earning as I have and that what this report is showing to all.

I. INTRODUCTION

In the 18th century, advances in science and technology ushered in the industrial revolution, ushering in a new age in human civilization. The information and communication revolution in the twentieth century revolutionized the way we organize our lives, economies, industries, and organizations. These remarkable advancements in modern times have unquestionably improved the quality of our lives. Simultaneously, this has resulted in a slew of issues, including the massive amount of hazardous waste and other waste generated by electric products. These and other hazardous pollutants constitute a serious threat to human health and the environment.

As a result, appropriate waste management is vital for the protection of livelihood, health, and the environment. It is a severe difficulty for modern society, and it necessitates concerted efforts to solve it in order to achieve long-term growth.

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Wastes are substances or items that are disposed of, intended to be disposed of, or are required to be disposed of by national legislation, according to the Basel Convention. Furthermore, wastes are materials that individuals are obligated to dispose of, for example, due to their harmful nature. Our regular activities generate a significant number of diverse wastes from various sources.
For its kind, the electronic industry is the world's largest and most innovative. Every year, thousands of tons of electronic goods are transported across oceans. However, after a period of use, they degrade into a complicated waste product. It contains a variety of dangerous heavy metals, acids, toxic compounds, and non-biodegradable plastics, among other things. Around 75% of e-waste are unsure of their purpose or ways to put them to good use, such as refurbishment, remanufacture, and reuse of parts for repair. Because of their inexpensive labor, most e-recyclers were shipping dangerous items like leaded glass and mercury lamps to underdeveloped countries. Poverty is the primary motivator for third-world countries to consume e-waste from Europe and the United States.

II. RESEARCH METHODOLGY

A. We have used both Primary and Secondary Method.

We bring first hand data as we coordinated to many peoples that how they see E waste problem in their life. From one person we came to know that pollution is so much increasing as there is now a very tiny plastic particles in our blood also.
Some told us how they recycle as they use to sell their old phones, laptop and someone then reuse it. Then at last recycle it.
AND, we also use secondary data also we collected the data from out sources as from government sites, 'E-waste in India' prepared by the Research Unit of the Rajya Sabha Secretariat on April 5, 2011.
From SSRN journals we have collected data. Elsevier, Taylor and Francis we have also used to make our research more and more effective.

B. Asian Journal of Applied Science and Technology (AJAST)

E-waste is a vast stream and covers a wide range of EEE categories. This study focused on one widely used electronic device, mobile phones. The selection of mobile phones over other electronics was due to their large product consumption quantity, continuously decreasing lifespan, and high obsolescence rate as a result of the ongoing advancements and new models launched every year, thereby making this device highly discarded by consumers and adding more to the accumulated e-waste in the country on annual basis. UAE also has a high mobile phones penetration rate and is among the highest in the Middle East according to . Hence, the consumption of mobile phones is very high in the UAE, which makes the resulting waste mobile phones add a significant portion to the e-waste stream, thereby requiring more attention.

III. REVIEW of LITERATURE ON E WASTE MANAGEMENT

A. Swati A. Patil, Neetu M. Sharma

International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013)

Electronic waste is informally known as e-waste for the electronic products nearing the end of their useful life. The e- waste products contain materials that are hazardous to the human beings, depending on their condition & density. In India electronic waste is producing in a huge quantity, since it has emerged as an it giant and due to modernization of lifestyle. Fridge, cell phones, discarded computers, mobiles & batteries etc, if not disposed properly, can leach lead & other substances to soil & underground water. This paper highlights the issues related to e-waste disposal methods & management of e-waste.

B. Prof. Arnav Chowdhury, Prof. Jitendra Patel

Prestige e-Journal of Management and Research
Volume 4, Issue 1 (April, 2017) ISSN 2350-1

Central issue of the present study is electronic-waste (e-waste) that is rising as a brand new environmental challenge for twenty first century.

The rapid climb of the electronic and IT trade, gift client culture, increasing rates of consumption of electronic product have led to fateful environmental consequences. E-waste, while recycling, is also risky due to toxicity of a number of the substances which contains several cancer-causing agents. The implications and toxicity is thanks to discharge of lead, mercury, cadmium, metallic element and alternative virulent substances. 316

C. Ms. Neethu Lukose

Electronics industry is the world's largest and fastest growing manufacturing industry. But the increase in sales of electronic equipments and their rapid obsolescence such as advancement in technology, change in fashion, style and status has resulted in generation of electronic waste which is popularly known as E-waste. E-waste contains many hazardous components that may negatively impact the environment and adversely affect human health if not properly managed. This is coupled with India's lack of appropriate infrastructure and procedures for its disposal and recycling. The challenge is to develop innovative and cost- effective solutions to decontaminate polluted environments due to E-waste.

D. Sai Lakshmi, Aiswariya Raj and T. Jarin

Asian Journal of Applied Science and Technology (AJAST)
Volume 1, Issue 9, Pages 33-36, October 2017

E-waste or Electronic wastes are referred to the electronic goods that are dumped out or unwanted. Each year, around 50 million ton of e-wastes are produced.

Depending upon their nature of reaction, there are possibilities for dangers depending upon the situation. Discarded computers, batteries and other electro chemical wastes may results in unwanted results. So it's important to be awake of e wastes in addition to the other physical wastes. The situation is alarming as 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 alternative available at present. This paper discusses the present scenario of e-waste management and possible e-waste handling strategies in India.

E. Rama Mohana R. Turaga and Kalyan Bhaskar

Electronic waste (e-waste), that is, waste arising from end-of-life electronic products such as computers and mobile phones, is one of the fastest growing waste streams in the world today. Annual global production of e-waste is estimated to surpass 50 million tons in 2020

IV. E WASTE

Electronic material or e-waste reports discarded electric or electronic devices. Old electronics which are intended for reuse, marketing, rescue, recycling, or management are also considered e waste. Informal process of e-waste in developing countries may lead to harmful cause health outcomes and environmental pollution.

Biodegradable plastic (even in process) poses something of a method if applied in the proper way. Humans wants to take responsibility for their actions by disposing of material in the proper way. If one litters or engages in criminal action, whether you're an individual or international firm, one wants to be fined the proper measure for the actual cleaning.

Electronic waste elements, such as CPUs, include possibly toxic materials, e.g., lead, cadmium, beryllium, or brominated flame retardants. Usage and management of e-waste may require considerable danger to well-being of workers and societies in developed nations and good care must be taken to prevent harmful danger in recycling processes and leaking of materials such as heavy metals from landfills and incinerator ashes.

A major environmental problem has been created as a result of unregulated accumulation and recycling of e-waste, which can endanger human health. Technology has revolutionized our way of life, but it has also created an immediate and long-term concern.

E-waste has become an immediate and long-term environmental concern, as its unregulated accumulation and recycling can produce major environmental problems that threaten human health.

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A. E-Waste Management

It is believed that 80% of electronic products are stored owing to a lack of knowledge on how to manage them. These electronic wastes are left unattended in homes, offices, and other buildings, and are frequently mixed with domestic garbage before being disposed of in landfills. In industries, e-waste management should start at the point of generation. This can be accomplished through waste minimization strategies and product design that is environmentally friendly. In the industrial sector, waste minimization entails inventory management, production-process modification, volume reduction, recovery, and reuse.

The materials utilized in the manufacturing process are properly controlled in inventory management. The amount of waste generated can be minimized to some extent by reducing both the quantity of hazardous materials utilized in the process and the amount of excess raw materials in stock. This can be accomplished in two ways: through the establishment of material-purchase review and control procedures and through the use of an inventory monitoring system. The first stage in developing an inventory management programme is to develop review procedures for all material purchased.

B. Danger of e waste

Toxic substances like cadmium and lead in circuit boards; lead oxide and cadmium in monitor cathode ray tubes (CRTs); mercury in switches and flat screen monitors; polychlorinated biphenyls in older capacitors and transformers; and brominated flame retardants on printed circuit boards, plastic casings, cables, and PVC cable insulation that release highly toxic dioxins and furans when blasted. Even in industrialized countries, it has been discovered that the materials are complicated and difficult to recycle in an environmentally beneficial way. The toxic elements in the compositions of electrical and electronic appliances that can be damaging to health and the environment are included below:

Metal Danger

LEAD-The kidneys and reproductive system are also affected by this poison. Excessive amounts might be lethal. It has an impact on children's mental development. Lead is released as powder and fumes when CRTs (cathode ray tubes) are mechanically broken and solder from microchips is removed.

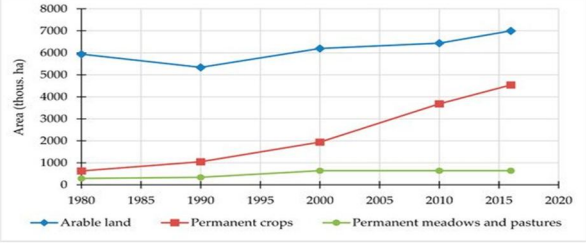
Plastics-They include carcinogens and can be found in circuit boards, cabinets, and cables. Carcinogenic brominated dioxins and furans are released by BFRs, or brominated flame retardants. Dioxins have the potential to disrupt the reproductive and immunological systems. Dioxins are also produced when PVC, a component of plastics, is burned. BFR has the potential to seep into landfills. BFR is found in even the dust on computer cabinets

Chromium-Used to keep a computer's metal housings and plates from corroding. Inhaling hexavalent chromium or chromium can harm the liver and kidneys, as well as induce bronchial problems like asthma and lung cancer.

MERCURY- The central nervous system, kidneys, and immunological system are all affected by mercury.

The electronic manufacturing services business shrank by 11% in 2009 as a result of the worldwide recession of 2008-2009. However, economists anticipate that the electronic industry would increase at a compound annual growth rate of 8% from 2010 to 2014. This is due to a revival in consumer spending in the latter part of 2009.Such a projection would indicate that obsolescence would be a constant feature in the electronic manufacturing industry's growth dynamics. As a result, the generation of outmoded electronic devices, often known as e-waste, is expected to rise in tandem with the growth of the electronics sector. Because of the increased price and availability of these products, they are gradually making their way into smaller towns, which are now seeing excellent consumer electronics sales. Some consumer goods, such as refrigerators and televisions, were once-in-a-lifetime purchases. However, as new items enter the market, consumers outgrow previous ones, and they discover that buying new electronic equipment is easier and less expensive than repairing an old product. The electronic industry produces substantially more waste than other industries due to its high rate of obsolescence. This has been exacerbated by a shift in Indian purchasing patterns, which has led to the country's high levels of e-waste generation.

Given below is the quantity of e-waste generated by Indian states according to an assessment study conducted by the International



C. Resource Group Systems South Asia Pvt. Ltd (IRGSSA) in 2005.

The study is primarily based on the average national penetration levels of computer in the population. Quantity of WEEE (Waste Electrical and Electronic

Equipment) generated in Indian States

State/UT WEEE	
Andaman and Nicobar Islands 92.2	Kerala 6171.8
Andhra Pradesh 12780.3	Lakshadweep 7.4
Arunachal Pradesh 131.7	Madhya Pradesh 7800.6
Assam 2176.7	Maharashtra 20270.6
Bihar 3055.6	Manipur 231.7
Chandigarh 359.7	Meghalaya 211.6
Chhattisgarh 2149.9	Mizoram 79.3
Dadra and Nagar Haveli 29.4	Nagaland 145.1
Daman and Diu 40.8	Orissa 2937.8
Delhi 9729.2	Puducherry 284.2
Goa 427.4	Punjab 6958.5
Gujarat 8994.3	Rajasthan 6326.9
Haryana 4506.9	Sikkim 78.1
Himachal Pradesh 1595.1	Tamil Nadu 13486.2
Jammu and Kashmir 1521.5	Tripura 378.3
Jharkhand 2021.6	Uttar Pradesh 10381.1
Karnataka 9118.7	Uttarakhand 1641.1
	West Bengal 10059.4
	Total 146180.7

The State of Maharashtra tops the list generating 20,270 tonnes of e-waste annually. The other States leading in the generation.

V. FINDINGS

According to the Global E-Waste Monitor Report 2020, India's e-waste generation has increased over 2.5 times to 3.23 million metric tonnes in the six years leading up to 2019. Since 2011, India has been the only country in South Asia to have a dedicated legal framework for dealing with e-waste.

The informal sector handles more than 95 percent of this waste, exacerbating the situation. According to a report by the Central Pollution Control Board, India created 1,014,961.2 tonnes of e-waste for 21 different types of EEE in the fiscal year 2019-2020. Another issue is that the material is of a certain type.

The global market for electrical and electronic equipment (EEE) has increased at an exponential rate, but product lifespans have shrunk. As more of these products end up in landfills and recycling facilities, policymakers face a new challenge.

The goal of this study is to present an overview of the e-waste problem and to propose an estimating method for calculating e-waste growth.

There is no significant difference in the awareness on the subject of existent of E-waste in college students of professional and non-professional streams. All the students are having awareness of existent of e-waste.

There is significant difference in the awareness on the subject of Risk of E-waste in college students of professional stream with their non-professional counterparts. The students of professional stream are having more awareness of Risk of e-waste than the students of non-professional stream.

There is no significant difference in the awareness on the subject of E-waste management in college students of professional and non-professional streams. All the students are unaware of proper e-waste management.

VI. SUGGESTIONS

1) One must Sell or donate your electronic devices to those in need is one of the greatest and easiest ways to reduce your electronic waste impact.

2) Improperly handled e-waste is getting increasingly dangerous, particularly as the volume of our e-waste grows.

3) Many people donate their old electronics to the less fortunate. It not only breathes fresh life into the item, but it also makes you feel good about yourself.

4) Maintaining your gadgets to extend their life is one of the best methods to save money and reduce e-waste. Here are a few pointers to help you get started.

5) Investing in environmentally friendly devices has a number of interconnected advantages.

6) On the behalf of the results of the study it is state that the awareness on the subject of the risk and management of e-waste are extremely low and urgent measures are required to consider this issue. Being a responsible citizen we should play a role in e-waste management as donating electronics items for reuse, which extends the lives of valuable products and keep them out of the waste management system for a long time. When buying electronic products, always try for those that are made with less toxic constituents, use recycled content, are energy efficient, and are designed for easy upgrading or disassembly. The building of user awareness program through public awareness campaigns.

VII. CONCLUSION

Our civilization is littered with e-waste. They have a complicated chemical makeup and it's difficult to quantify their fluxes on a local and international scale. Pollution generated by their haphazard management has harmed the environment, primarily in impoverished nations that receive them for recycling and metal recovery. Many technological innovations have been made in order to minimize the environmental effects of generated e-waste.

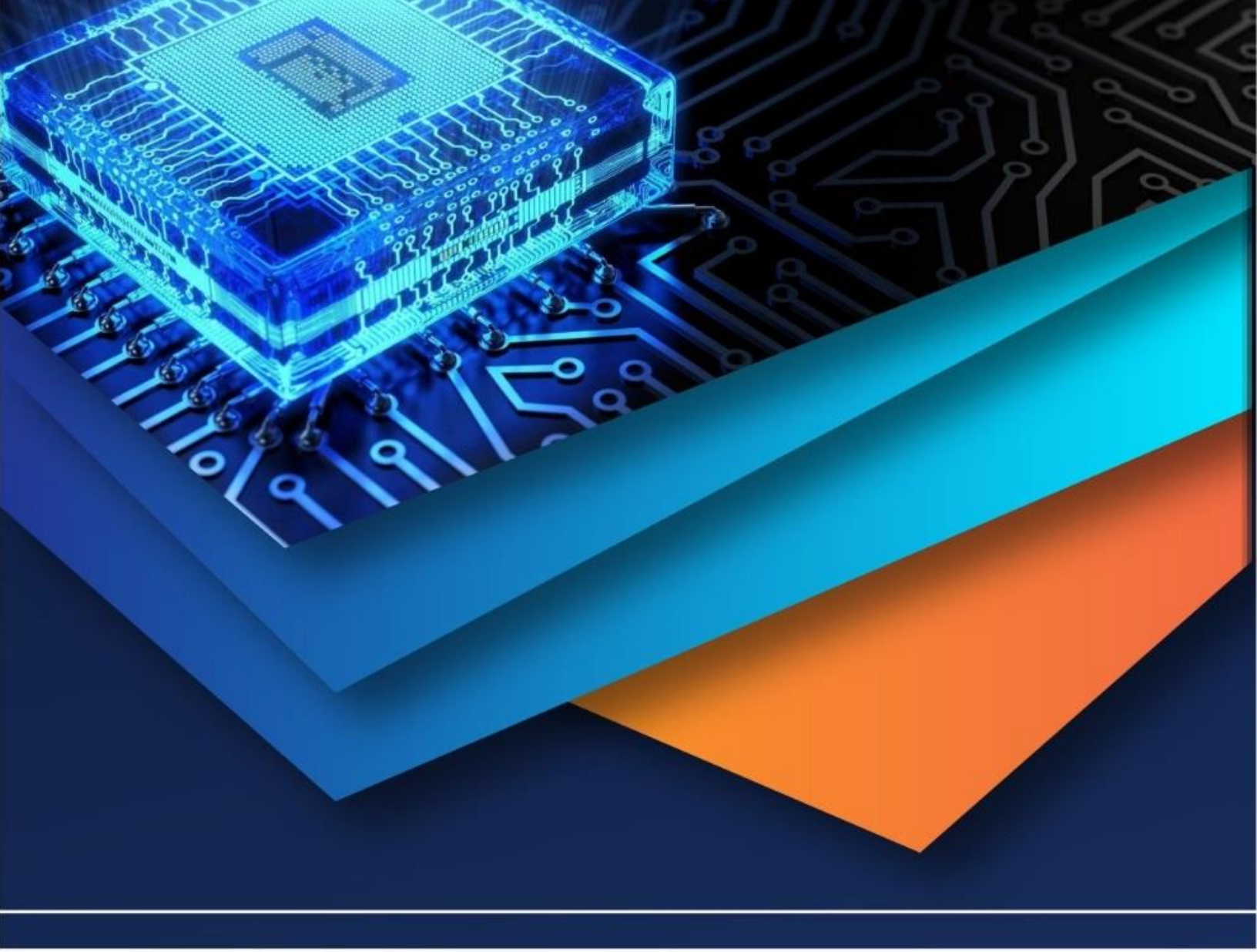
They are as follows: CRT screens are being phased out in favor of LCD screens. Optical fibres have been introduced (Cu elimination from the cablings). Rechargeable batteries were introduced (Ni, Cd was reduced, while Li was increased), and so on.

The manufacture of "halogen-free" appliances that do not contribute to the formation of PCBs and dioxins (but production is more expensive).

Legislative restrictions (up to 1000 mg/kg for lead, mercury, PBBs, and PBDE).

To summarize, separating e-waste from the rest of solid garbage and successfully recycling it for the recovery of valuable raw materials are critical. The management system must be well-thought-out. The benefits to the environment from collection, transportation, and management, as well as the financial benefits from recovery, should not be offset by the system's required resources and energy consumption.

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