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Study of E-Waste Management in Kashmir Region

Aaqib Javaid Mufti[1], Simranjot Kaur[2], and Dr Sandeep Singla[3]

[1]M. Tech Scholar, Department Civil Engineering, RIMT University Mandi Gobingarh , Punjab, India
[2]Assistant Professor & Head, Department of Civil Engineering, RIMT University Mandi Gobingarh, Punjab, India
[3]Professor & Head, Department of Civil Engineering, RIMT University Mandi Gobingarh, Punjab, India

Correspondence should be addressed to Aaqib Javaid Mufti; aaqi.jmufti@gmail.com

ABSTRACT - The act of widespread, careless, and haphazard disposal of e-waste for monetary gain, along with government ineptitude and unorthodox systematic supervision of it in any community, is undeniably unsafe and destructive to the country's public health and economy as a whole. Untreated e-waste poses a significant hazard to public health and people's quality of life in general. It also shatters and renders the environment unproductive for no apparent reason. Furthermore, it is the socially and economically weaker members of society who suffer the most under these situations. With the growing number of people purchasing electrical and electronic items, numerous regions are being utilized as dumping grounds for e-waste, and flaws in government waste management methods have made WEEE a severe challenge. Previously, the management of e-environmental wastes and sustainability had a low priority. Lack of financial resources, institutional flaws, improper technology selection, and public unawareness towards WEEEM are some of the elements that have led to the growing trend in the perception of E-Waste as a concern. On the other hand, the economic benefits of WEEE through the recovery and recycling of materials, which can then be reused and re-sold as secondary materials, is a great way for individuals to get jobs and businesses to generate cash. The problem of e- waste, its sources, content, and treatment as associated garbage have all been critically examined in this research.

KEYWORDS- E-waste, Incineration, Kashmir, Landfilling, Treatment.

I. INTRODUCTION

A) General

India is one of the world's major emerging economies and home to the world's fastest-growing economy. The nation is rapidly changing its consumption patterns of electronic gadgets as a result of its rising per capita income and the fact that the majority of the population is young. In comparison to many high-income countries, the Indian market is greater. Since the last decade, the country has seen an exponential surge in demand. In India, electronic waste is becoming a severe public health and environmental issue. India is the world's "fifth-largest electronic waste producer," producing around 2 million tons of e-waste annually and importing an undetermined amount of e-waste from other countries. Computer gadgets account for roughly 70% of e-waste each year, with the telecommunications industry contributing 12%, medical equipment accounting for 8%, and electric appliances accounting for 7%.

The law further states that producers are responsible not only for garbage collection, but also for ensuring that the waste reaches an approved recycler or dismantler. Despite new standards in place to securely treat this hazardous material, up to 80% of e-waste— outdated computers and cellphones, cameras and air conditioners, televisions and LED lamps— continues to be broken down, posing significant health and environmental risks by polluting groundwater and soil. In the country, e-waste is developing at a compound annual growth rate (CAGR) of about 30%. ASSOCHAM, one of India's apex trade organizations, estimated that e-waste creation was 1.8 million tons per year in 2016 and will rise to 5.2 million tons per year by 2020.

B) E-Waste

E-waste is defined as old, end-of-life electronic and electrical (EEE) or garbage generated by any electrical or battery-powered equipment that is no longer fit for its original use or has passed its expiration date. Computers, servers, mainframes, monitors, compact discs (CDs), printers, scanners, copy machines, calculators, fax machines, batteries, cellphones, transceivers, TVs, iPods, medical equipment, washing machines, refrigerators, and air conditioners are examples of e-waste (when unfit for use). Due to rapid technological breakthroughs and the production of newer electronic equipment, these electronic equipment are quickly replaced with newer models [6]. This has led to annex potential increase in e-waste generation. People are more likely to move to newer versions, and product lifespans have shortened.

C) E-Waste Scenario in J&K

The impact of information technology (IT) on the global economy is enormous. It has changed the way people engage with one another and has become a key service provider. However, the IT industry in Jammu and Kashmir is still in its early stages. The state of Jammu and Kashmir's

IT policy was started in 2004 with the belief that IT has the ability to grow rapidly and become a key contributor in the state's economy, as well as contribute considerably to improved, transparent, and effective governance (PHD chamber, 2011). According to the J&K State Pollution Control Board's inventory from 2009-10, total E-waste creation in the state was projected to be around 492.32 tonnes, with per capita generation of 0.054 kg. The amount of e-waste dismantled in the state was projected to be in the billions of dollars.

II. LITERATURE REVIEW

Kurian Joseph [1] presented a waste management system with shared responsibility for the collection and recycling of electronic wastes amongst the manufacturers / assemblers, importers, recyclers, regulatory bodies and the consumers.

Mathew J. Realf et al.[2] in their publication titled "E-waste: an opportunity", understood that designing a waste management system could be a big problem for nations, most especially the developing nations, where the most part of e-waste send up. These authors pointed out that in order to achieve an efficient e-waste management system that government, individual and business must have a common goal.

In their second edition book, "Strategic corporate social responsibility: stakeholders in the global environment," William B. Weather, Jr. and David Chandler [3] were very careful in their discussion of SR as it affects company sustainability on both a national and global scale. It also discussed the significance of an organization's CSR policy, as well as how to put one in place. The book examined the influence of shareholders in any corporation and provided ideas on how an organisation might harness the strength and resources of its stakeholders for the benefit of the organization's growth.

S Chatterjee et al. [4] in their published academic journal titled "Effective electronic waste management and recycling involving formal and non-formal sectors", pointed out the problems facing developing nations with regards to management of -waste. The authors argued that WEEEM can be a profitable business if managed professionally. In addition, they observed that technology is a vital tool in e-waste management process, as they referred their point to e-waste-to-resources management in developed nations.

E-waste volume, UNEP focussed to build the capacity of practitioners and policy makers for preparing and developing WEEE/E-waste management systems. It summarized current practices in developed and developing countries on WEEE/E-waste management, the technologies for E-waste management (collection, transportation, treatment and disposal) and the important pre-requisites for effective and sustainable WEEE/E-waste management [5].

Mark Anderson [6] focussed on consumer electronics and their life-cycle quoting that in the United States alone, 130 000 computers and more than 300 000 cell-phones are trashed each day.

Nnorom I.C., Osibanjo[7] provided a case study of E-Waste management in India and using some efficient methods for EWaste Management Like "RRR".

Bandhopadhyay, a.[8] in his paper said that WEEE constitutes 8% of municipal waste and is one of the fastest growing waste streams. The fraction of precious and other metals in e-waste is over 60%, while pollutants comprise a meager 2.70%. Given the volume of WEEE generated containing toxic materials, it emerges as a risk to the society. Considering the high toxicity of these pollutants especially when burned or recycled in uncontrolled environments, the Basel Convention has identified e-waste as hazardous, and developed a framework for controls on transboundary movement of such waste. In contrast, WEEE can offer a tremendous business opportunity if it would treat in proper manner. The management of the WEEE has thus become a global challenge in today's world.

III. METHODOLOGY FOR ENVIRONMENTALLY SOUND MANAGEMENT OF E-WASTE

A) Treatment and Disposal of E-waste

Sustainable garbage disposal is a big issue that necessitates meticulous planning and execution. The reason for this is that it entails both the processing of e-waste to render it harmless and the eventual disposal of it without causing harm to humans or the environment. The final step in the WEEEM process is disposal. When planning a waste disposal facility, there are a number of factors to consider. Issues such as waste types, the type of waste residue that needs to be disposed of, the level of toxics in the waste, the location to be used as a disposal site, the availability of land or site for waste disposal facility construction, the right design for waste disposal facility with respect to the waste decomposition process and by-products, and the involvement of the appropriate stakeholders are all factors to consider.

Considering these factors gives a solid foundation for creating an effective waste management system. It also serves as a testing ground for scientific and technological research on the many types of trash disposed of. It also makes the WEEEM safe and long-lasting. There are various types of disposal methods in both developed and underdeveloped countries. Scientific landfilling and incineration for energy generation are, however, the most common and sustainable ones utilised in industrialised countries. In underdeveloped countries like India, where infrastructure is scarce or non-existent, open field dumping, unplanned landfilling, and open burning are the most typical ways.

B) Sanitary Landfilling

It's a method of garbage disposal in which trash is buried between layers of dirt in order to replenish or recover low-lying land. This is a typical technique employed in abandoned or disused quarries, burrow pits, mining voids, and erosion sites. A landfill's efficiency is governed by its design, management, and mission objectives. A well-built and managed landfill can be a cost-effective and sanitary

method. On the other, a poorly constructed and managed one can cause a variety of environmental issues like as disease breeding grounds, pollution, and an eyesore. It's important to remember that landfills produce a by-product in the form of methane.

For the following reasons, it is currently impossible to quantify the environmental implications of E-waste in landfills:

- Landfills are made up of a variety of waste sources.
- Pollution emissions from landfills can be postponed for many years.

One study on landfills found that the environmental concerns of e-waste landfilling can't be overlooked because the conditions in a landfill site differ from those in native soil, notably in terms of metal leaching behaviour. Cd and Hg are also reported to be emitted in diffuse form or through the landfill gas combustion facility. Landfilling does not appear to be an environmentally desirable treatment strategy for materials that are volatile and not biologically

viable, despite the fact that the dangers cannot be measured and tracked back to e-waste.

C) Incineration

It entails the thermal annihilation of waste, or the method of destroying trash by turning organic material into carbon dioxide and water using fire. The reduction in trash volume and exploitation of the energy content of combustible materials are two advantages of e-waste incineration. For recycling, certain plants extract iron from slag. Some environmentally toxic organic chemicals are converted into less dangerous compounds through burning. The discharge of gases escaping flue gas cleaning and the significant volume of leftovers from gas cleaning and combustion are also disadvantages of incineration. If this procedure is not correctly controlled, dangerous heavy metals including lead, mercury, cadmium, and ashes can be released into the air. Mercury that is released into the air can build up in the food chain, especially in fish.

D) Environmentally Sound E-waste Treatment Technologies

Environmentally sound E-waste treatment technologies (EST) are procedures and materials that reduce environmental damage by generating fewer potentially harmful compounds, recovering such substances from emissions prior to release, or utilising or recycling manufacturing leftovers. EST refers to technologies that, when compared to other technologies, have the potential to significantly improve environmental performance. In general, these technologies aid in the following:

- Protection of the environment and ecosystem
- And are less polluting in comparison.
- Use resources in a way that is both sustainable and judicious
- Make an effort to recycle more rubbish and products.
- As comparison to the technologies for which they are alternatives, handle all residual wastes in a more environmentally responsible manner.

The dynamics of technological transition will not be limited to a single technology for developed and emerging countries. Rather, cutting-edge and old technology will coexist on a global scale. Developing countries must increase their ability to acquire, analyse, and select technologies based on their own needs and development priorities, and then adapt these technologies to unique local conditions in order to make the most of ESTs. Technology will play a critical part on the route to sustainability in its new position.

IV. FINAL ANALYSIS FOR ALL THREE LEVELS OF TREATMENT

E-waste treatment technologies (EST) that are environmentally friendly are used at three levels, as shown below:

a) Treatment at the first level
b) Treatment at the second level
c) Treatment at the third level

Table 1: Emissions from 1st Level

Emissions	Dismantling	Segregation
Air	√ (fugitive)	X
Water	X	X
Noise	√	√
Land/ Soil Contamination due to spillage	√	√
Generation of hazardous waste	√	√

Table 2: Emissions from 2nd level

Unit Operations / Emissions	**Dismantling**	**Shredding**	**Special Treatment Process**			
			CRT	**Electro-magnetic**	**Eddy Current**	**Density Separation**
Air	√(fugitive)	√ (fugitive)	X	√ (fugitive)	√ (fugitive)	X
Water	X	X	√	X	X	
Noise	√	√	√	√	√	X
Land/ Soil Contamination due to spillage	√	√	√	√	√	√
Generation of hazardouswaste	√	√	√	X	X	X

Table 3: Input, Output and operations at 3rd Level

Input / WEEE Residues	**Unit Operation/ Disposal/Recycling Technique**	**Output**
Sorted Plastic	Recycling	Plastic Product
Plastic Mixture	Energy Recovery/ Incineration	Energy Recovery
Plastic Mixture with BFR	Incineration	Energy Recovery
CRT	Breaking/ Recycling	Glass Cullet
Lead bearing residue	Secondary Lead Smelter	Lead
Ferrous metal scrap	Secondary steel/iron recycling	Iron
Non-Ferrous Metal scrap	Secondary copper and aluminum smelting	Copper/ Aluminum
Precious Metals	Au/ Ag separation	Gold/ Silver
CFC	Recovery/ Reuse and Incineration	CFC/ Energy recovery
Oil	Recovery/Reuse and Incineration	Oil recovery/ energy
Mercury	Separation and Distillation	Mercury

V. CONCLUSION

In today's society, electronic and electrical devices cannot be avoided. The same can be said about trash electronic and electrical equipment. As long as this remains a necessary evil, it must be best managed to minimize its negative environmental effects. These effects can be reduced by implementing EPR-mandated improvements in product design, such as the adoption of environmentally suitable replacements for hazardous compounds. To achieve this valued goal, a legislative framework for implementing EPR and RoHS must be put in place. Adoption of ecologically sound technology for e-waste recycling and reuse, as well as EPR and RoHS, provides a feasible alternative for environmentally sound e-waste management.

Also, the government must ensure that sufficient funds are available to carry out various reduce, recycle, and recover works in a timely manner in order to alleviate the sufferings of the common people as a result of the continuing devastation caused by E-Waste, just as their counterparts in American and European countries have explicitly demonstrated, failing which, due to any indecisiveness, time will only be wasted in cosmetic works just for public consumption, until this E-Waste is eradicated.

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