

Role of Biological Tools in the Management of E-waste in India

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Abstract

The unused or non-working electrical items are popularly known as e-waste or electronic waste, which are increasing day by day in our life, in today's world we are seeing the technology is growing fast and it has become a big part of our life, technology and its applications are now omnipresent in our daily life so, it is imperative to say that without technology we are not able to live for a while, today computer, smartphone, television, internet have become our big need. Just we are getting the benefits of technology we are also facing its ill effects as well on us and on the environment, over the past two decades the growth rate of electrical and electronic equipment is increased continuously, on the other hand the life span of these products become shorter these e-waste if not properly dumped or managed it creates lots of health problems for us, so the principle aim of this paper to show the management of e-waste in India with the help of biological tools.

Keywords: E-waste; technology; management; biological tools; electronic equipment; smartphones.

Introduction

The expansion of technology has increased our facilities as well. In this changing world, we gradually become dependent on machines and electrical appliances today. The increasing number of these modern electrical devices and their waste after use has made our lives. It has a severe impact on our environment when this electric or electronic equipment becomes useless. The broken cell phones, broken AC, refrigerators, computers, laptops, printers, home-use machines Coolers etc. are put up in his category. For this reason, it is increasing today, after the USA and China in the

world, India has reached third place in producing this waste.

The problems of e-waste are becoming deadlier day by day. All the expansion of technology has given us many facilities, the same and we are all falling prey to this electronic waste. The substances and gases generated by e-waste are killing our health in to severe extent. If this e-waste is disposed of in the open, that is, when burned, carcinogens - dibenzo para dioxin (TCDD) and neurotoxins like toxic gases are produced. These gases directly affect our body's physical development, fertility and immunity. The affected systems of the body can cause hormonal imbalance and diseases like cancer.

E-waste management is the need for the present time. If this management applied properly and scientifically then it is possible to reduce toxicity

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spreading due to generated E-waste. In an unscientific way, it separates the waste and keeps it in the open for several days by breaking, burning and immersing it in acid, and this may spoil the health of associated workers. It also pollutes our environment. The substances present in the electronic waste are long-run hazardous in nature. These substances are tangible, corrosive, reactive, toxic, explosive or infectious. The matter of e-waste management requires constant attention.

Table 1: Average duration of discarding electronics.

Electronic equipment's	Average duration of discard
Mobile phones	1-3 years
Personal computers	2-3 years
Camera	3-5 years
Television /lcd	5-8 years
Refrigerators	8-10 years
IT accessories	Very frequent

After USA and China, India is on the 3rd position

for producing the e waste, these three countries together contributed 38% of total 53.6 million tones of e-waste generated worldwide in 2019.

Government Role in E-waste management

The Ministry of Electronics and Information Technology (MeitY) is engaged with many programs on awareness, recycling of E-waste. The mandate of this Ministry for the E-waste problem is "The charter for this programme is to bring together the triad of public, government and industry to adopt responsible measures for Sustainable electronics that is responsive to environmental needs. This needs proactive policy formation and mass deployment that would be the focus area."⁵ It is evident from the web site of The Ministry of Electronics and Information Technology (MeitY), the Reverse Logistic Group-India is engaged in the management of E-waste. As per the published report of the RLG-India (as put up in figure 1.0) the various activities undertaken was highlighted.



Fig. 1.0: Reverse Logistic Groups-India activities on E-waste. (Ref. <https://greene.gov.in/wp-content/uploads/2020/11/2020111190.pdf>)

Biological tools for E-waste management

There are so many scientific ways and methods of management of e-waste but in this paper, we are

focusing on the biological tools for the management of e-waste that is called bioleaching, this is also called as "green process" in which some bacterium is used as a carrier for recycling the e-waste,

however this process is gradual in nature, the bacterium *Chromobacterium violaceum* is known for producing antimicrobial agent called violacein.² With referenceto theconservation.com web site pyrometallurgy and hydrometallurgy are the present times technologies involved in the extracting and recycling e-waste metals. They require high temperatures and toxic chemicals. This makes them extremely harmful to the environment. Also, in addition they require lots of energy and produce large volumes of toxic gas too, creating more pollution and leaving a large carbon footprint. The modern mining industry has relied on it for decades, using microbes - mainly bacteria, but also some fungi - to extract metals from ores.⁷

Microorganisms are able to change metals chemically, thus releasing it free from the surrounding rock. They allow it to dissolve in a microbial soup. The metals can easily be extracted from microbial soup and purified. from which the metal can be isolated and purified. Bioleaching requires very little energy and so has a small carbon footprint. No toxic chemicals are used either, making it environmentally friendly and safe.⁷

Discussion:

Many bacteria play main role in e waste -management. They do so by various process like bioleaching, Bio absorption, bioaccumulation, Biotransformation, Phytoremediation, Phytoextraction, Biomineralization etc. Government plays a major role in creation of awareness about the problems of E-waste and their related management. The toxic and hazardous materials present in these wastes can lead to severe environmental and occupational hazards, if not handled properly. However, presence of significant quantity of valuable recoverable material makes it a potential secondary resource for metal extraction. Composition of E-waste is complex with 38% ferrous material, 28% non-ferrous material, 19% plastic, 4% glass, 11% other (wood, rubber, ceramic, etc.). Although the precious materials are only 1% by weight, it accounts to nearly 80% of the total

intrinsic value.

Mass scale Public Movement is current need for reduce, recycle and regenerate related to E-waste.

Summary and Conclusion

The review study compiled the major ongoing research in E-waste management and also efforts for the creation of awareness among masses. In India there is need to control this problem before becoming uncontrollable demon in society. The E-waste are dangerous and hazardous to mankind. We all must know the proper standard of procedure of disposal of electronic items after use. There are several scientific ways of management of electronic waste but the biological method might be the best because these methods can be more sustainable and other techniques like heating, adding chemicals.

References:

1. Jordan Adnan Tarawneh, Motasem Saidan, Households Awareness, Behaviours, and Willingness to Participate in E-waste Management, 2013,10.5923/j.jje.20130305.04
2. Roberta Kwok PNAS, Inner workings: how bacteria could help recycle electronic waste. January 15, 2019 116 (3) 711-713; <https://doi.org/10.1073/pnas.1820329116>
3. Tay SB, et al. Enhancing gold recovery from electronic waste via lixiviant metabolic engineering in *Chromobacterium violaceum*. (2013) Sci Rep 3:2236. Google Scholar
4. Vishwa mohan, India third largest e-waste generator in the world ,capacity limited to treat only one fourth of its waste, July 4 2020, timesofindia.indiatimes.com.
5. <https://greene.gov.in/>, Ministry of Electronics and Information Technology (MeitY), Government of India.
6. Ref. <https://greene.gov.in/wp-content/uploads/2020/11/2020111190.pdf>
7. <https://theconversation.com/were-using-microbes-to-clean-up-toxic-electronic-waste-heres-how-14365>