IJMRT: Volume (4), Issue 9, 2022
International Journal of Multidisciplinary Research Transactions
(A Peer Reviewed Journal)
www.ijmrt.in

ISSN (Print):2663-2381
ISSN(Online):2663-4007

Green Computing: E-waste Management in Kolhapur

Akshay Yadav[1], Shreya Kadam[2], Prashant G. Tandale[3*]

[1,2] *Student, Bharati Vidyapeeth Deemed University, Institute of Management, Kolhapur, Maharashtra, India.*
[3] *Assistant Professor, Bharati Vidyapeeth Deemed University, Institute of Management, Kolhapur, Maharashtra, India.*

[*]Corresponding author

DoI: https://doi.org/10.5281/zenodo.7089146

Abstract

Over the previous two decades, rapid urbanisation and extensive usage of electronic gadgets have resulted in a massive volume of electronic trash, resulting in soil, water, and environmental degradation. As a result, pollution control and environmental safety have become a top priority for environmental scientists and campaigners around the world. Electronic trash disposal, which is a by-product of the urbanisation process, has become a big issue in our society. Because these wastes are not biodegradable, their slow deposition causes the build up of numerous hazardous metals such as lead (Pb), cadmium (Cd), and other contaminants in the soil and ground water. Contamination of ground water, in turn, has a negative impact on plants, animals, and the living system as a whole, posing serious health risks and illnesses. As a result, effective disposal of these electronic wastes has become a vital need. We examine many sources of e-waste, their consequences, and procedures for managing these toxic and hazardous wastes in order to make the development process more sustainable and greener in this study. E-waste, metal toxicity, recycling, segregation, and sustainable development are all terms that come to mind when thinking about e-waste.

Keywords: E-waste, Metal Toxicity, Recycling, Cadmium, Lead, Hazardous, Biodegradable.

1. Introduction

The utilisation of electronics and computational resources has increased dramatically in this era of information and communication technology. Excessive usage of electronics equipment has resulted in a slew of problems, including high energy consumption, global warming, the accumulation of e-waste, pollution, and so on. Faced with the harsh realities of global warming and rising energy bills, governments and commercial companies around the world have begun to look into measures to defend themselves the natural world There is a rising global movement to develop more environmentally friendly computers to address these challenges.

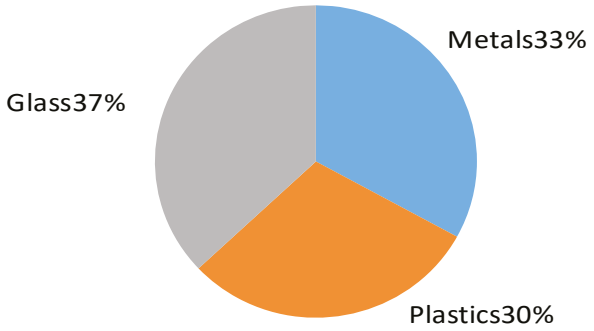

Figure .1. Components of E-Waste

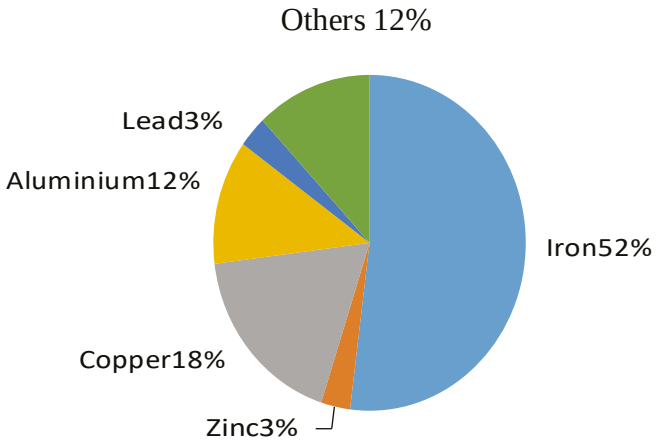

Figure. 2. Metallic Constituents of E-waste

2. Green Computing

The efficient use of computing resources is referred to as green computing. It's the moniker given to a movement that promotes a more environmentally friendly manner of computing by reducing power consumption. It is also linked to the proper use of computing resources and plays a key role in reducing their harmful environmental impact. The decrease of energy usage and pollution management are two important challenges linked with green computing. While the former can be accomplished through proper use of electronic goods and the development of energy efficient and low-power technology, the latter can be accomplished through reduced use and proper recycling. policies, as well as the use of less harmful materials in the equipment's manufacture. Other features of green computing include maximising economic viability and assuring sustainability. We are focused on difficulties connected to waste management and recycling in this paper, which are part of the above-mentioned features of green computing.

3. Waste Management

Waste is defined as any substance that is discarded. It's a vital raw material that's been misplaced. Many wastes are now being used in an inefficient or unusable manner, posing significant risks to human health and the environment. With the right processing technologies, it can be transformed into a useful product. These wastes come in a variety of shapes and sizes, and they can be classified as hazardous or non-hazardous. These can be broken down even more. Municipal wastes, electronic wastes, biomedical wastes, and industrial wastes are divided into four categories. Many research have been conducted in different parts of the world to determine if there is a link between health and hazardous wastes. Certain compounds, such as cyanides, mercury, and polychlorinated biphenyls, are exceedingly poisonous if

released unchecked, and exposure to them can cause disease or death. According to some studies, residents who are exposed to hazardous waste have a higher risk of cancer.

There are some names of Hospital and College in Kolhapur and their E-Waste Management:

- D.Y. Patil Hospital and Research Centre
- Tulip Trauma care & Multispecialty Hospital
- Apple Saraswati Multispecialty Hospital
- Pulse Hospital
- Mary Wanless Hospital
- Kamalakar Hospital
- KAMGAR HOSPITAL ESIC HOSPITAL
- Sunrise Multispecialty Hospital
- J K Multispecialty Hospital
- The New College
- Kamala College
- Shri Shahaji Chhatrapati Mahavidyalaya, Kolhapur
- D. Y. Patil College Of Engineering & Technology
- Govt Medical College & CPR Hospital, Kolhapur
- Chhatrapati Shahu Institute of Business Education And Research
- D.R.K. College of Commerce
- Shahaji Law College
- Shahaji College
- Government Polytechnic
- Dr.Bapuji Salunkhe Institute of Hotel Management (Vivekanand College)

Sr. No	Name of Organization in south Kolhapur	E-West In kg in Last Year	Organization Name for collecting E-West
1	D.Y. Patil Hospital and Research Centre	250 kg	ProSpark Recyclers
2	Tulip Traumacare & Multispecialty Hospital	150kg	ProSpark Recyclers
3	Apple Saraswati Multispecialty Hospital	300kg	ProSpark Recyclers
4.	PULSE HOSPITAL	150kg	Kalpataru Enviro Consultants
5	Mary Wanless Hospital	130kg	Kalpataru Enviro Consultants
6	Kamalakar Hospital	140kg	GMC Engineers and Environmental Services
7	KAMGAR HOSPITAL ESIC HOSPITAL	90kg	Kalpataru Enviro Consultants
8	Sunrise Multispecialty Hospital	140kg	Kalpataru Enviro Consultants
9	J K Multispecialty Hospital	90kg	GMC Engineers and Environmental Services
10	The New College	50kg	ProSpark Recyclers
11	Kamala College	40kg	ProSpark Recyclers

12	D. Y. Patil College Of Engineering & Technology	150kg	ProSpark Recyclers
13	Govt Medical College & CPR Hospital, Kolhapur	90kg	ProSpark Recyclers
14	Chhatrapati Shahu Institute of Business Education And Research	60kg	ProSpark Recyclers
15	D.R.K. College of Commerce	40kg	ProSpark Recyclers
16	Shahaji Law College	60kg	ProSpark Recyclers
17	Shahaji College	50kg	ProSpark Recyclers
18	Government Polytechnic	70kg	ProSpark Recyclers
19	Dr.Bapuji Salunkhe Institute of Hotel Management (Vivekanand College)	80kg	GMC Engineers and Environmental Services

3.1 E-waste

E-waste is one of the world's fastest growing waste streams. It accounts up about 1% of total solid trash in wealthy countries on average. E-waste is one of the fastest-growing waste streams, thanks to rising "market penetration" in emerging nations, "replacement market" in industrialised countries, and "high obsolescence rate." It contains things like Televisions (TV), laptops, Liquid Crystal Display (LCD), plasma panels, printing-scanning machines, mobile

phones, and a variety of other household, medical, and industrial equipment are all abandoned when new technologies become available. Every year, massive amounts of these wastes are wasted, and because they include poisonous and carcinogenic substances, they pose a significant risk to the environment. Lead and cadmium are used in computer circuit boards, lead oxide and cadmium are used in cathode ray tube displays, mercury is used in switches and flat screen monitors, cadmium is used in computers, and polychlorinated biphenyls are used in older capacitors, transformers, and batteries. Approximately 14 million PCs, 16 million mobile phones, and 80 million televisions are used by Indians nowadays. As a result, there is a compelling need to address e-waste management, particularly in developing countries. Countries in transition, such as ours. The presence of valuable recyclable components in electronic waste draws unorganised and informal sectors, but their unsafe and environmentally hazardous methods endanger human health and the environment.

3.2 Problems

E-waste is a problem that affects both manufacturers and consumers. More e-waste is generated when improved models based on new technology hit the market. Manufacturers also refuse to accept responsibility for their products after they are sold, leaving consumers with the burden of disposal. The current situation of electronics trash management is appalling. While the majority of it is recycled, the remainder is disposed of in landfills. According to a research, nearly 70% of heavy metal was discovered. Electronic waste, which contaminates ground water, is found in landfills. If these wastes are burned instead being buried or deposited, they produce harmful pollutants and pollute the air. Though computer design has developed astonishingly well and remarkably quickly in terms of performance, the work is still in its infancy from a green standpoint. Traditionally, lead, cadmium, mercury, and other poisons have been used in computer production. According to environmental specialists, a

computer carries 4 to 8 pounds of lead and accounts for two-fifths of all lead in landfills, along with other electrical gadgets. Computers pose a significant threat not just in terms of hazardous waste generation, but also in terms of power consumption and heat generation. to the community "Data centre servers require 50 times the energy per square foot as an office," says Mark Bramfit, lead programme manager at PG&E. The largest source of energy consumption is data centres; many businesses spend more on energy than on gear such as servers. Energy expenditures, which currently account for around 10% of the average IT budget, are expected to climb to 50% in the coming year. Faster processors consume more power, and the waste heat they generate raises temperature and creates reliability issues such as disc crash, device failure, and other issues, all of which contribute to waste creation. To deal with these problems, air conditioners are utilised, which consume a lot of electricity and discharge a lot of heat into the environment, making the situation worse. The entire process is a vicious loop of waste heat creation and high energy use. Furthermore, the emission of Chlorofluorocarbon (CFC), which can deplete the ozone layer, is the most serious environmental concern posed by an air conditioner. To combat the rising pollution dangers around the world as a result of the increased usage of electronic devices in general, and computers in particular, an eco-friendly computer is required.

3.3 Health Risks

If necessary safeguards are not taken, garbage recycling poses a health risk. Workers who handle garbage including chemicals and metals may be exposed to harmful substances and develop a variety of physical diseases, impairments, and other health problems. Toxic exposure can be lethal in some cases. As a result, medical waste disposal and Toxic metal wastes necessitate extra caution in order to avoid serious health risks.

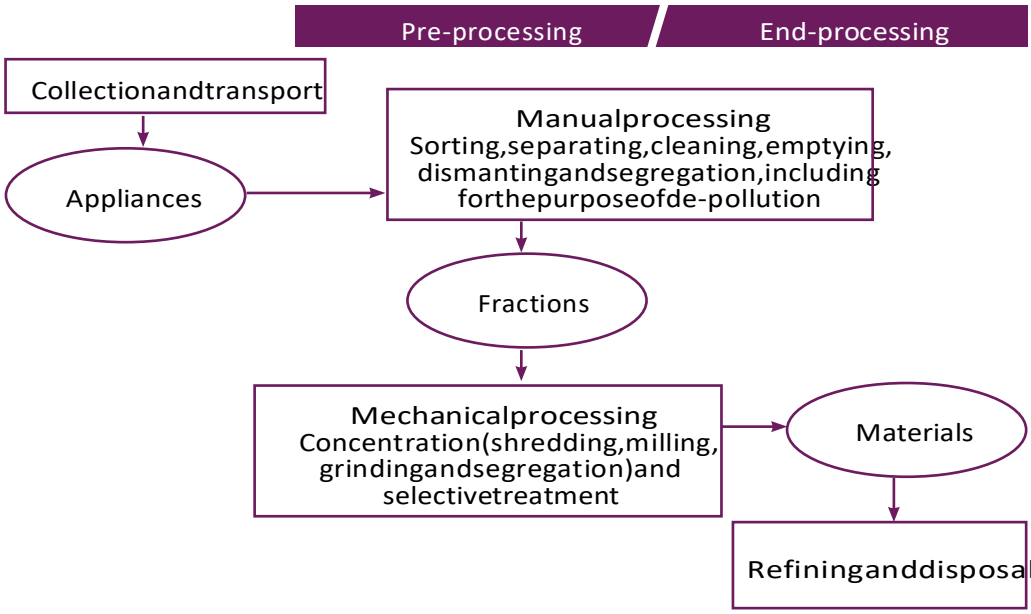

Figure. 3. Process flow of e-waste recycling

3.4 Recycling

Environmental scientists emphasise the 3R (reduce, recycle, and reuse) approach as an alternative to the current e-waste management technique to address the aforementioned difficulties associated to excessive usage of electronics equipment and their impact on the environment. Because reducing the use of electrical equipment in a developing culture like ours is not an option, we must instead focus on reuse and recycling techniques. Aside from that, other companies are currently exploring for other environmentally acceptable solutions for industrialization and long-term development. We believe that a combined strategy using scientific approaches can reduce e-waste generation at the source. With meticulous planning, harmful chemicals can be separated at the source. Reduce pollution and create a more environmentally friendly society. Electronic equipment that is no longer in use or that is no longer wanted should be disposed of in a convenient and environmentally friendly manner.

Toxic metals and contaminants found in computers can release dangerous emissions into the environment. Computers should never be thrown out in the trash. Computers should be recycled through manufacturer programmes like HP's Planet Partners recycling service or community recycling centres. Computers that are still functional might be donated to non-profit organisations. Open burning of circuit boards or the use of potentially dangerous acid stripes are two of the recycling procedures used in India. IP chips are repurposed. The pieces that can't be used are dumped in the open to extract metals such as copper. PVC-coated cables are burned in the open. Also utilised is nitric acid. to get rid of gold and platinum Both open burning and acid baths expose workers to toxins and put the health of local people at risk. This has been connected to a number of health issues, including Silicosis, Respiratory discomfort, and Pulmonary Oedema.

3.5 The way out

Electronic waste, if correctly managed, can be a lucrative source of secondary raw materials. Recent legislation, such as the Waste Electrical and Electronic Equipment Directive (WEEE) and the "restriction of the use of certain hazardous substances in electrical and electronic equipment" directive (RoHS), as well as current and future methods for waste treatment, recycling, and disposal, would eventually lead to green development and an eco-friendly society. At the moment, the main focus in e-equipment design is that they are energy efficient. However, the time has come for manufacturers to place a greater emphasis on manufacturing safe electronics equipment that uses biodegradable, less toxic, and environmentally friendly raw materials.

Computer users' and enterprises' work habits can be changed to reduce their negative influence on the environment. Minor modifications in our work habits can have a significant

impact on environmental safety. The following are some simple yet effective methods that can be taken to make computing more environmentally friendly:

• Only printing what is absolutely necessary.

• Whenever possible, use recycled material paper.

• The ability to print on both sides of the paper.

• To the extent practicable, using recycled and used ink and toner cartridges.

• Choosing high-quality, energy-saving equipment with a higher star rating.

• Keeping computers switched off when not in use rather than in standby mode, as PCs consume roughly 10 watts of power even in standby mode.

• Buying new equipment only when it is absolutely necessary, not just because a new model is on the market.

• Buying compact systems with the bare minimum of peripherals and attachments.

• If not in use, unplug devices such as printers, audio systems, scanners, and modems.

• Charging the UPS battery as efficiently as possible rather than leaving it on all day.

4. E-Waste Categories

. Categories of E-Waste

- Large Household Appliances - Washing machines, Dryers, Refrigerators, Air-conditioners, etc.
- Small Household Appliances - Vacuum cleaners, Coffee Machines, Irons, Toasters, etc
- Office, Information & Communication Equipment- PCs, Laptops, Mobiles, Telephones, Fax Machines, Copiers, Printers etc.
- Entertainment & Consumer Electronics

Televisions, VCR/DVD/CD players, Hi-Fi sets, Radios, etc

- Lighting Equipment- Fluorescent tubes, sodium lamps etc. (Except: Bulbs, Halogen Bulbs)
- Electric and Electronic Tools- Drills, Electric saws, Sewing Machines, Lawn Mowers etc. (Except: large stationary tools/machines)

Toys, Leisure, Sports and Recreational Equipment, Electric train sets, coin slot machines, treadmills etc. Medical Instruments and Equipment, Surveillance and Control Equipment Automatic Issuing Machines

5. Conclusion

So far, we, the consumers, have been concerned solely with the speed, price, and performance of electronic devices, and have paid little attention to their environmental implications while purchasing them. People have begun to choose safer and greener models as their concern for environmental protection and sustainable development has grown.

To ensure that garbage disposal does not harm the environment or pose a health risk to the people who live in the region, proper waste disposal methods must be used. At the collecting stage, segregating E-Waste into a single, well-defined stream is definitely an excellent technique for facilitating subsequent efficient recycling and reuse. The creation of highly mixed waste streams, on the other hand, discourages the reuse of components and the recycling of high-value materials. Distancing of Recycling would be considerably easier with a smaller e-product.

ULTRA HIGH SHEARING (UHS) technology has been developed by a number of companies because it can recycle a wide range of wastes and does not require any chemical additives. It works on the principle of ultra-shearing, which involves creating a high

mechanical shear stress to break chemical connections between polymers and build a copolymer as a bridge between them. The final product is a high-quality, stabilised substance.

REFERENCES

[1]. Alireza, B., & Gordon, M. (2012). Challenges and Opportunities in E-Waste Management. Retrieved July 4, 2019, from https://www.researchgate.net/publication/269097592_Challenges_and_ Opportunities_in_E-Waste_Management

[2]. Archana, K., Kumar, M. J., Pankaj, C., & Rakesh, K. (2011). Recycling of Electronic Waste II: Proceedings of the Second Symposium - Wiley Online Library. Retrieved October 3, 2017, from http://onlinelibrary.wiley.com/book/10.1002/9781118086391

[3]. Arjun Jinachandran. (2015). E-Waste And Green Computing. Retrieved from https://www.slideshare.net/arjunjinachandran5/ewaste-and-greencomputing

[4]. Awasthi, A. K., Zeng, X., & Li, J. (2016). Comparative Examining and Analysis of E-waste Recycling in Typical Developing and Developed Countries. Procedia Environmental Sciences, 35, 676–680. https://doi.org/10.1016/j.proenv.2016.07.065

[5]. Balde, C. P., Wang, F., Kuehr, R., & Huisman, J. (2014). E-Waste Monitor. https://doi.org/10.1007/s00705-012-1479-4

[6]. Debnath, B., Roychoudhuri, R., & Ghosh, S. K. (2016). E-Waste Management – A Potential Route to Green Computing. Procedia Environmental Sciences, 35, 669–675. https://doi.org/10.1016/j.proenv.2016.07.063

[7]. Devin, P., Marie-Noel, B. D., Tapiwa, N., & Peter, S. (2014). E-Waste: A Global Hazard - ScienceDirect. Retrieved October 3, 2017, from http://www.sciencedirect.com/science/article/pii/S2214999614003208

[8]. GOK. (2019). Ministry of environment and forestry draft national ewaste management strategy, (January).

[9]. Heeks, R., Subramanian, L., & Jones, C. (2015). Understanding e-Waste Management in Developing Countries: Strategies, Determinants, and Policy Implications in the Indian ICT Sector. Information Technology for Development, 21(4), 653–667. https://doi.org/10.1080/02681102.2014.886547

[10]. Jaiswal, A., Samuel, C., Patel, B. S., & Kumar, M. (2015). Go Green with WEEE: Eco-friendly Approach for Handling E- waste. Procedia Computer Science, 46, 1317–1324. https://doi.org/10.1016/j.procs.2015.01.059

[11]. Joseph, K. (2007). Electronic Waste Management in India-Issues and Strategies. Proceedings Sardinia, (October), 1–5. Retrieved from http://www.nswai.com/docs/electronic waste management in india - issues and strategies.pdf

[12]. Mathias, S., Ruediger, K., Christian, H., & Federico, M. (2012). (PDF) Recycling - from e-waste to resources. Retrieved July 4, 2019, from https://www.researchgate.net/publication/278849195_Recycling_- _from_e-waste_to_resources [13] Nayab, N. (2011). Benefits of e-Waste Recycling: Elimination of Health and Environmental Hazards and Conservation of Resources. Retrieved August 16, 2017, from http://www.brighthub.com/environment/greencomputing/articles/71375.aspx

[13]. Ni, H.-G., Zeng, H., Tao, S., & Zeng, E. Y. (2010). Environmental and human exposure to persistent halogenated compounds derived from ewaste in China. Environmental Toxicology and Chemistry, 29(6), 1237– 1247. https://doi.org/10.1002/etc.160 [15] Omari, J. N., Mutwiwa, U. N., &Mailutha, J. T. (2016). The Current Status and Handling of E-Waste in Nairobi City County of Kenya ., 3(1), 22–28.

[14]. Osibanjo, O., &Nnorom, I. (2008). The Challenge of Electronic Waste (E-waste) Management in Developing Countries. Waste Management & Research : The Journal of the International Solid Wastes and Public Cleansing Association, ISWA, 25, 489–501. https://doi.org/10.1177/0734242X07082028

[15]. Otieno, I., &Omwenga, E. (2016). E-Waste Management in Kenya : Challenges and Opportunities. Emerging Trends in Computing and Information Science, 6(October), 661–666.

[16]. Panda, R. (2013). E-waste Management: A Step towards Green Computing. International Journal of Environmental Engineering and Management, 4(5), 2231–1319. Retrieved from http://www.ripublication.com/

[17]. Siddiqui, A. A., & Syed, A. (2013). Green Computing: E-waste management through recycling. Retrieved from http://www.academia.edu/6403222/Green_Computing_Ewaste_management_through_recycling

[18]. Tanskanen, P. (2012). Electronics Waste: Recycling of Mobile Phones | InTechOpen. Retrieved October 3, 2017, from https://www.intechopen.com/books/post-consumer-waste-recycling-andoptimal-roduction/electronics-waste-recycling-of-mobile-phones

[19]. Thakur, A., Ray, T. K., & Goel, M. K. (2016). E-waste - Management Practices in India. Epidemiology International, 1(3), 21–25. Retrieved from http://medical.adrpublications.in/index.php/EpidemInt/article/view/891