CHALLENGES OF E-WASTE MANAGEMENT IN THE CURRENT SCENARIO

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Abstract

The main focus of this paper entitled on challenges of E-Waste management in current scenario was to know the extent of e-waste in Thrissur district, Kerala and also know the challenges of e-waste management. There was a drastic increase in the usage of electric and electronic equipment due to technological up gradation, impact of liberalization, globalization and privatization, economic growth of the country, population growth, market penetration etc. E-Wastes generates from used electronic devices and household appliances which is not fit for original use and are waited for recovery, recycling or disposal. For the purpose of study, the equipments are classified into five as large household equipment, small household equipment, IT and telecommunication equipment, consumer equipment and lighting equipment. This study disclosed 18 percent of equipments are not in a working condition. 68% people were not aware about the evil effects of E-Waste and 32% had an awareness about the E-Waste management. It was also pointed out that 61% of people had used same methods to dispose both electronic wastes and solid wastes.

Keywords: E-Waste management, electronic equipment, Electronic waste, 3Rs

India is considered as one of the fastest progressing countries in the world that shows an ever growing demand for electronic equipment and gadgets. There is a drastic increase in the usage of electric and electronic equipment due to technological up-gradation, impact of liberalization, globalization and privatization, economic growth of the country, population growth, market penetration etc. The equipment which is not able to use for its original purpose and waited for recovery, recycling or disposal are termed as E-Waste that is, Waste from Electric and Electronic Equipments(WEEE). The reality is that "Today's electronic gadgets are tomorrows' electronic waste" that means computers, cell phones, various house hold devices such as TV, refrigerator, air conditioners etc are become tomorrow's e-wastes. Over the last couple of decades, as a result of globalization, liberalization, privatization and technology revolution, India has become the epicenter of electronic items. It's no surprise that many households and companies today find themselves saddled with used or obsolete IT equipment to be discarded known as electronic waste or e-waste. The electronic waste management assumes greater significance in India not only due to the generation of our own waste but also dumping of e-waste particularly computer waste from the developed countries. Electrical waste contains hazardous but also valuable and scarce materials. Hazardous items are badly affected the environment and human life. High valued materials like gold, platinum and non-renewables and toxic materials such as lead, cadmium, beryllium, mercury arsenic are included in the e-wastes that makes a lot of health problems.

E-waste management can be defined as the "safety disposal of the electronic items which are being useless because of many reasons such as advancement in technology, changes in life styles, fashions and status, nearing the end of their useful life etc." E-waste contains ferrous and non-ferrous metals, plastics, glass, wood and plywood, printed circuit boards, concrete and ceramics, rubber and other items. 50% of e-waste is iron and steel and also contains 21% plastics, 13% non-ferrous metals and others. Non-ferrous metals consist of metals like copper, aluminium and precious metals such as silver, gold, platinum, palladium etc. The hazardous substances of e-waste are the elements of lead, mercury, arsenic, cadmium, selenium and hexavalent chromium etc. It is the right time to reduce the consumption of products that ultimately become e-waste by maintaining older equipment or purchasing higher quality products with a longer useful life, reuse products by selling them or donating them to

others and keeping them out of the waste stream. Then recycle unwanted electronics with an environmentally responsible recycler who will either refurbish them for reuse, or break them down to commodity level where they can be used again as raw materials. The awareness e-waste management helps to save our country from e-waste formation and to encourage formal sector growth the government has issued a number of environmental laws, regulations and technical guidance over the past decade while also collaborating on national and international e-waste projects and conduct different study for highlighting pivotal policies and laws related to e-waste processing. The key to success ewaste management is 3Rs namely Reduce, Reuse and Recycle.

STATEMENT OF THE PROBLEM

Simply we can say that e-waste is discarded electrical or electronic devices. The used electronics destined for reuse, resale, salvage, recycling or disposal is also termed as e-waste. In a developing country like India, the growth rate of e-waste is unimaginable due to rapid growth of technological devices, increased population and even human mentality. This causes serious health and pollution problems in our country. Hence it is important to know the awareness level of people regarding e-waste management at Aluva. No systematic study has been conducted so far in this regard in Aluva. Hence the present study is proposed.

SIGNIFICANCE OF THE STUDY

E waste is becoming an unavoidable problem of every growing society. Thrissur district, the cultural city of Kerala is one of the major town which have tremendous role in the development of the state. A proper and systematic study using primary and secondary data can reveal the awareness level of the people regarding e-waste and the challenges of e-waste management in Thrissur district. With the help of this study, the extent of the e-waste in Thrissur district could be found out. The existing literature shows that there is no previous research conducted to investigate the challenges of e-waste management in Thrissur to find out the best solutions to overcome the increasing growth rate of e-waste.

SCOPE OF THE STUDY

This study is conducted among the people residing at Thrissur district during the period of September and October 2020.

OBJECTIVES

- To find out the extent of the e-waste deposit at Thrissur district.
- To know the present status of handling e-waste among people residing at Thrissur.
- To understand the challenges of e-waste management among people residing at Thrissur.
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RESERCH METHODOLOGY

The study is descriptive in nature. The population of the study was the people residing at Thrissur district. 111 samples were selected through sending Google forms. Both primary and secondary data were needed for the study. Primary data could be collected through structured questionnaires distributed online among the people residing at Thrissur district. The secondary data could be collected from published documents, journals, newspapers, magazines, websites etc. The data collected would be suitably classified and analyzed keeping in view the objectives of the study. For the purpose of analysis appropriate statistical tools would be used. The study was conducted among the people residing at Aluva during the period of September and October 2020.

LIMITATIONS OF THE STUDY

1. The study was among only 111 people residing at Thrissur district.
2. The response given by the people may not be true. Some of them tried to show themselves as they practiced e-waste management even if they have not such habit.
3. As non-random sampling was used, the limitations of non-random sampling would be reflected on the conclusions drawn.

REVIEW OF LITERATURE

Ramzy Kahhat(2008) recommended a solution for E-Waste management termed as *e-Market for Returned Deposit*, begins with a deposit paidby consumers to sellers at the time of purchase, electronically registered and tracked via a radio-frequencyidentification device (RFID) placed on the product. At end-of-life, consumers consult an Internet-enabledmarket in which firms compete to receive the deposit by offering consumers variable degrees of return onthe deposit. After collection of the computer by the selected firm, the cyberinfrastructure utilizes the RFIDto transfer the deposit to the winning firm when recycled. If the firm chooses to refurbish or resell thecomputer in lieu of recycling, the transfer is deferred until true end-of-life processing.

Brett H Robinson(2009) stated that most E-waste is disposed in landfills. Since effectivereprocessing technology with minimal environmental impact is expensive, rich countries export an unknownquantity of E-waste to poor countries, where recycling has done without any protection to human health and the environment. This results E-Waste associated contaminants in water, food chains and environment and E-waste workers suffer negative health effects thro ugh skin contact and inhalation.

Qiang Liu et all(2009) recommended a few solutions for E-Waste management in developing countires as improve policies to control the importation ofsecondhand appliances, build environmental protectedindustrial parks to recycle e-wastesto alleviate the negative impact of e-wastes on theenvironment, improve the methods to protect therecycling workers and strengthen the educational programfor worker protection, improve the recycling technologyto decrease the release of toxic heavy metals and organiccompounds, and ensure an effective system for monitoringthe health of the recycling workers and of theenvironment. He also suggested that the developed countries have to follow some steps to control E-Wastes as control the export of e-wastesstrictly, assist with funding and technology support todeveloping nations on building environmental protectionindustrial parks and the recycling of e-wastes, support and organise in the global effort to find solutions to the e-wastemanagement and recycling and also assist with the establishmentof international standards and a certification system for themanagement of e-wastes.

The Greenpeace, 2008 report predicts the global WEEE arising from PCs, mobile phones and televisions will be around 5,504,737 MT in the year 2010 and 9,762,935 MT by the year 2016. The UN estimates that some 20-50 MT of e-Waste is generated worldwide each year.

E-WASTE MANAGEMENT IN INDIA.

All types of waste are not only imported but generated in India, hazardous industrial waste, municipal solid waste and e-waste. The quantum of wastes generated over the past several years have posed an ever increasing threat to environment and public health. Over eighty-eight critically polluted industrial zones have been identified by the CPCB. Pollutants from such zones contaminate water bodies and rivers and even pollute the ground water in many places. Studies have also shown that crops are contaminated through industrial effluents but the scale of such an impact has yetto be identified.

As far as e-waste is concerned, it has emerged as one of the fastest growing waste streams worldwide today. The sheer amount of electronic equipment reaching end-of-life poses a huge

challenge. Computers and electronics equipments are designed without giving sufficient attention to the aspects such as downstream impacts, and the ease of recycling. Thus, their dismantling is also extremely labour-intensive. As long as electronic products continue to contain an assortment of toxic chemicals and are designed without recycling aspects, they would pose a threat to environment and public health at their end-of-life. As electronic products are currently constituted, e-waste recycling operations in any country will generate polluting residues and emissions. Toxics Link has reported that India has over 1.38 million obsolete computers with manufacturers addingabout 1,050 tonnes of electronic scrap every year. It is currently estimated that India produces some 3.8 lakh tonnes of e-waste annually. E-waste now forms over 70 per cent of landfills. When developing countries like India start tightening and enforcing stricter legislation on transboundary movements of e-waste, developed countries may find it harder to avoid the issue of recycling and disposal through export. However, in March, 2010, in the journal titled Environmental Science and Technology, author Eric Williams, Assistant Professor in Arizona State University, wrote, "Trade bans will become increasingly irrelevant in solving the problem (of e-waste)". He argues that a complete ban on export of used and end-of-life electronics to developing countries would fail to solve the problem because the developing world would generate more used and end-oflife electronics than the developed countries as early as 2017. Additionally, by 2025, the developing world would generate twice the amount of electronic scrap as what will come from the developed nations.

Considering the future scenario, it is imperative that thesafe management of waste is done in an organized mannerwith sufficient resources and sustainable recyclingtechnologies on the one hand and effective legislations andmonitoring mechanisms on the other. In Delhi, in the wakeof the Mayapuri radiation leak incident, the government hadissued guidelines and advisories to all heads of hospitals,medical centres, diagnostic centres and medical labs usingradioactive equipment and consumables for their safedisposal, as per the directives of the Atomic EnergyRegulatory Board (AERB) under the Atomic Energy (SafeDisposal of Radioactive Wastes) Rules, 1987, and the AtomicEnergy (Radiation Protection) Rules, 2004. Ironically, underthe AERB directives, the rules prescribing detailed guidelinesregarding medical exposure, potential exposure, personal monitoring, quality control and even appointing radiation workers and radiological safety officers already exist. The incident highlights the need to have a clear cut disaster protocol and to implement effective regulation and monitoring mechanism to ensure that the rules are adhered to.It also calls for the regulatory infrastructure to allow for the protection of workers and community rights. There has to be sufficient rights for citizens to take legal recourse for damages caused to their health, environment and property.

DATA ANALYSIS AND INTERPRETATION

111 samples were collected by using google form for this study. The following are the socio-demographic profile of the respondent.

Table No:1 Table showing demographic profile among the respondents

Variables		Frequency	Percentage
Type of family	Nuclear	92	83
	Joint	19	17
Accommodation	Own	106	95
	Rented	5	5
Family monthly income	Less than Rs10,000	34	31
	Rs10,000 – Rs25,000	38	34
	Rs25,000 – Rs50,000	19	17
	Above Rs50,000	20	18
Educational Background	SSLC	24	21
	Diploma	5	5

	Under graduation	31	28
	Post graduation	39	35
	Professional	9	8
	Ph.D	3	3
Employment background of the family	Government employment	21	19
	Private employment	55	50
	Self employment	35	31

Source:Primary Data

From the above table, it is noted that 83 percent respondents came from nuclear family and 95 percent respondent have their own house. About their monthly income, 31 percent have only less than Rs10,000 and at the same time 35 percent respondent have more than Rs25,000 monthly income. 21 percentage respondents have only SSLC back ground even in Kerala. 19 percent family have government employment back ground. 68% people were ignored about the evil effects of E-Waste and 32% had taken into consideration about the E-Waste management. People had a tendency to held E-Waste before disposal for a period of below 6months (31%), 6months – 1 year(7%), 1year – 2years (19%) and above years (43%).

Table No:2 Table showing details of e-waste deposit at Thrissur district

Variables	Total	Not –in-use	Not –in-use (%)
Large house hold appliances	481	204	42%
Small house hold appliances	666	181	27%
IT and tele-communication items	723	352	49%
Consumer items	716	408	57%
Lighting items	946	232	25%
Average	**706**	**128**	**18%**

Source:Primary Data

To measure the extend of E-Waste deposit at Aluva, all electric and electronic items were classified into five namely large household equipment, small household equipment, IT related equipment, consumer equipment and lighting equipment. Large household appliances covered fridge, air conditioner, oven, electric heater and washing machine. Small household appliances involved iron box, fan, kettle, mixy or othe blenders and alarm clock. Desktops, laptops, printers, scanner, fax machine and modem were the items included in . theIT and tele-communication items. Consumer items coveredTV, radio, stereo, DVD player, VCR player, MP3 player, camera and game console. and lighting items included bulbs, tubes, rechargeable lamps. 57 percent of the consumer items are e-waste, followed by 49 percent IT and tele-communication items due to technology upgradation. From the above table No.2, it was concluded that **18 percent of the products were not used for their own purpose i.e., e-waste.**

Table No:3 Table showing the details of e-waste handling at Thrissur district

Variables	Dumbing	Throwing	Reusing	Recycling
Large house hold appliances	16%	3%	50%	31%
Small house hold appliances	17%	9%	43%	31%
IT and tele-communication items	21%	5%	49%	25%
Consumer items	19%	9%	51%	21%
Lighting items	34%	18%	23%	25%
Average	**21%**	**9%**	**43%**	**27%**

Source:Primary Data

Dumbing, throwing, reusing and recycling are the major mechanism for managing e-wastes. On an average 21 percent of the e-wastes were dumped in their own houses, 43 percent had reusing capability and 27 percent had gone through recycling. Particularly 9 percent of the e-wastes were throwing as landfills. The e-wastes particularly lighting items were the highest dumbing items in the house.

Table No: 4 Table showing Details of e-waste handling at Thrissur district based on Fried man test

Challenges of e-waste management	Minimum	Maximum	Mean	Std Deviation
No formal e-waste collection center	1	5	3.78	1.099
Absence of infrastructure for appropriate e-waste management	1	5	3.86	1.034
Absence of legislation dealing specifically with e-waste	1	5	3.79	0.885
Absence of the End-of-life product take-back policy as part of Extended Producer Responsibility(EPR)	2	5	3.84	0.879

Source: Primary data

The four major mechanism adopted by the households in the e-waste management were dumbing, throwing, reusing and recycling. The study tried to find out the reasons/ challenges against the e-waste management. Based on the mean score, the most important challenge in the e-waste management was the absence of infrastructure for appropriate e-waste management(3.86), followed by absence of end-of-life product take-back as part of extended producer responsibility(3.84) and absence of legislation dealing specifically with e-waste. Another important challenge faced by Thrissur district is that there is no more formal e-waste collection centers.

Table No:5 Table showing the influence of education on challenges facing e-waste management based on Kruskal-Wallis Test

Education	Mean	Chi-square Value	P-Value
SSLC	51.60	9.187	0.102
Diploma	47.30		
Under graduation	46.74		
Post graduation	66.17		
Professional	52.33		
Ph.D	80.17		

Source: Primary data

Based on the Kruskal- Wallis test, it was noted that there was no influence of education on the opinion of the challenges facing in the e-waste management since the p-value was greater than 0.05.

Table No:6 Table showing the influence of family monthly income on challenges facing e-waste management based on Kruskal-Wallis Test

Education	Mean	Mean rank	Chi-square Value	P-Value
Less than Rs10,000	45.22	4	9.434	0.024*
Rs 10,000 – Rs 25,000	53.79	3		
Rs 25,000 – Rs 50,000	64.63	2		
Above Rs 50,000	70.33	1		

Source: Primary data *Sig value is less than 0.05

Since p-value of Kruskal-Wallis test was less than 0.05, it was found out that there was an influence of family monthly income in the opinion of the challenges facing in the e-waste management. As per the mean rank of Kruskal – Wallis test, the high earning families have concern about e-waste management and vice versa.

Table No:7 Table showing the influence of employment nature on challenges facing e-waste management based on Kruskal-Wallis Test

Education	Mean	Mean rank	Chi-square Value	P-Value
Government employee	66.19		2.680	0.262
Private employee	54.24			
Self-employee	52.66			

Source: Primary data

Based on the Kruskal- Wallis test, it was noted that there was no influence of education on the opinion of the challenges faced in the e-waste management since the p-value was greater than 0.05.

DISCUSSION

Due to technology up-gradation and a system of unclear family increases the extent of e-waste. The study also revealed that majority people were ignored about the evil effects of E-Waste. They do not know what is the difference between solid waste and e-waste. People had a tendency to held E-Waste before disposal for a long period. 18 percent of the electric and electronic items were not in a working condition. This study showed that consumer equipments were the major contributors of e-waste. Most of the households did not hold lighting equipment waste, they dispose it as early as possible, but not in a scientific way. 18% of the electric and electronic equipments were not in a working condition. Mobile phones were the major source of e-waste. 21 percent of the e-waste were dumbed in their own house.

People must be aware about the quality of the electronic products irrespective of their price. It is necessary to conduct awareness classes among people about the effects of e-waste. There should be an effective method to dispose of electronic waste. Government must take initiative in the matter of e-waste by making legislation regarding this. It is high time to implement producer take back policy to reduce the impact of e-wastes. As income increases, the people have a tendency to improve the consciousness about the e-waste management.

CONCLUSION

E-Waste is now one of the fastest growing waste streams around the world and needs imperative action today. Developing countries like India are facing enormous challenges related to the generation and management of E-waste which are either internally generated or imported illegally. Most of the people in India do not know how to dispose their obsolete electrical and electronic gadgets. It is estimated that 18 percent of electronic items are stored due to uncertainty of how manage it. We must take corrective actions to manage this dangerous growing waste stream. Tele communication equipment need special treatment as they involves almost all dangerous constituents that effects health. We must aware about the importance of e-waste management and propagate 3Rs namely **Reduce, Reuse and Recycle** in E-Waste management.

BIOGRAPHICAL NOTE:

Dr Princy Francis has more than 9 years of teaching experience at MES Asmabi College, Vemballur. She has been awarded Ph. D. in Commerce from M. G. University, Kottayam. She holds B.Com and M.Com degrees from Calicut University and has successfully cleared NET (UGC) & SET

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BIBLIOGRAPHY

Bhutta, M. K. S., Omar, A., & Yang, X. (2011). Electronic Waste: A Growing Concern in Today's Environment. *Economics Research International*, *2011*(2), 1–8. doi:10.1155/2011/474230

Deubzer, O. (2012). Recommendations on Standards for Collection, Storage, Transport and Treatment of E-waste. *StEP*, *6579*(June), 60. Retrieved from http://www.residuoselectronicos.net/wp-content/uploads/2012/11/StEP_GP_End-of-Life_final-2.pdf

Dwivedy, M. (2013). *Modeling and Assessment of e-waste Management Issues in India : Generation , Flows and Extended Producer Responsibility*. Birla Institute of Technology and Science, Pilani, Rajasthan, India.

G.A. Chukwudebe, SMIEEE, FNSE and U.H. Diala, MIEEE, M. (2013). No Title. *Federal University of Technology, Owerri, Nigeria*.

Gaidajis, G., Angelakoglou, K., & Aktsoglou, D. (2010). E-waste : Environmental Problems and Current Management. *Journal of Engineering Scien Ce and Technology*, *3*(1), 193–199.

Greenpeace International. 2008. Toxic Tech: Not in Our Backyard. http:// www. greenpeace.org /raw/ content/international/ press/reports/not-in-ourbackyard.pdf (Accessed February 26, 2008).

Hayter, S. (2011). *the 21st Century*. (S. Satpal, Ed.) (pp. 305–324). New Delhi. doi:10.1177/0022185610397144

Ingram, J. C. (2012). E-R Esponsibility : E-Waste , I Nternational L Aw and a Frica ' S.

Irani, A. K. (2012). Examining Responsibility for Environmental Harm : Public Discourse and E-Waste Management Systems in a Developed Nation. *Ryerson University Dissertation*.

Kahhat, R., Kim, J., Xu, M., Allenby, B., Williams, E., & Zhang, P. (2008). Exploring e-waste management systems in the United States. *Resources, Conservation and Recycling*, *52*, 955–964. doi:10.1016/j.resconrec.2008.03.002

Lipnicka, B. (2010). Electronic Waste Management. Edinburgh.

Liu, Q., Li, K. Q., Zhao, H., Li, G., & Fan, F. Y. (2009). The global challenge of electronic waste management. *Environmental Science and Pollution Research*, *16*, 248–249. doi:10.1007/s11356-009-0131-7

Mcintire, A. I. C., & Mcintire, I. (2009). *Moving E-Waste Management into the 21st Century : Protecting Health and Wealth from the Dangers of Electronic Waste Waste*.

Mohamad, R., Building, A., & Ismail, N. A. (2010). Journal of Internet Banking and Commerce. *Journal of Internet Banking and Commerce*, *15*(3), 1–11. doi:10.1007/978-3-531-92534-9_12

Ospina, A. V, & Heeks, R. (2012). Strategy Brief 3: The Future Research Agenda for ICTs , Climate Change and Development. *Development*, 1–11.

Pérez, R. F. (2013). Tools for informal e-waste recyclers in Agbogbloshie , Ghana.

Rakib, A., & Ali, M. (2014). Full Length Research Paper Electronic Waste Generation : Observational Status and Local Concept along with Environmental Impact. *International Journal of Science Research in Knowledge*, *2*(10), 470–479.

Robinson, B. H. (2009). E-waste: An assessment of global production and environmental impacts. *Science of the Total Environment*, *408*(2), 183–191. doi:10.1016/j.scitotenv.2009.09.044

Thakker, N., & Aste, W. O. S. E. L. W. (2006). India ' s Toxic Landfills : A Dumping Ground for the World ' s Electronic Waste. *Sound Chemicals Management*, *6*(3), 58–61.

Union, E. (2008). Best practices for e-waste managmement in developing nations. *Management*.

Widmer, R., Oswald-Krapf, H., Sinha-Khetriwal, D., Schnellmann, M., & Böni, H. (2005). Global perspectives on e-waste. *Environmental Impact Assessment Review*, *25*, 436–458. doi:10.1016/j.eiar.2005.04.001

