

E-Waste Management with Special Reference to Household Products in Ernakulam District



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Abstract: E-waste is the largest producing squander in the 21st century. The evidence for reducing the size of e-waste is the raise in number of electronic firms. E-waste management is the major problem faced by the peoples. This study conducted for understanding the knowledge of peoples on hazardous sound effects of e-waste and also the disposal method which they taking for managing these e-waste. It is clear that peoples are aware about the e-waste but they are not handling the e-waste in a right way due to the unavailability of proper recycling methods. It should be safe for the environment as the e-waste will be cleared as soon as possible, because of the reality that the e-waste is rising day by day.

Key Terms: E-waste, Awareness of hazards, Disposal of waste, E-waste management.

I. INTRODUCTION

Last 10-15 years there was a big changes and growth in technology especially in electronic items like tablet, computer, phone, printer and also other electronics. Rapidly the business and households have seen great growth in the electronics and a safe and cost effective end of life management. The e-waste is one of the hastily creating natural issue for the globe. The constantly growing proportion of e-waste interrelated with the non-appearance of care and right capacity is structure up the issue. There are 10 recycling plant from around the world. For every year, an amount of waste which is greater than 20 million heaps were generating. It is essential to care the environment so the e-waste management may play a crucial role in preserving the environment and making free from dangerous toxins which pollute air, water, soil, etc. It is essential to follow the 4R approach, that is Reduce, Reuse, Recycle and Recreate for minimizing the waste. Generally large number of electronic items are used in households, IT industries and there are lot of disposal of e-waste takes place. We are mainly focusing on household products in Kanjoor Panchayath, Ernakulam district for getting easy and relevant information.

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Due to unavailability of e-waste plant in Kerala, people are struggling a lot to dispose e-waste. The disposal of electronic is referred to as e-waste. Otherwise the collective name for discarded electronic devices is known as e-waste. The inflow of waste comes from various sources such as Television, Fridge, Washing Machine, Telephones, Personal Computers, etc. The term e-scrap will be more apt sum up to 99% of the materials and its making, an electronic product is recyclable and it has a value in secondary market.

II. LITERATURE REVIEW

Kumar A, M. Holuszko, and D. C. R. Espinosa (2017) in this paper he states about the generation of e-scrap and the sales of electrical and electronic equipments. The calculation made by them about the total quantity of e-waste created has reached more or less 41 million tones in 2014 and increasing in proportion mode each year. He observed that the population of the nation does not have a major impact. And it also mentioning the significance and benefits of recycling. According to Norazli Othman (2015) there should be a sustainable incorporated system for supervising the electronic waste. Also suggested that new legislation and Act should be for managing e-waste.

Result of research of Sikdar & Vaniya (2014) confirmed that government should establish a few area related to removal of e-waste materials. Also pointed that cause of e-waste on healthiness of creature in ecological teaching as a necessary topic from lower to higher grades.

According to Sivakumaran sivaramanan (2013) Public knowledge and support of manufactures are crucial for electronic waste managing method and in addition it is the duty of government to provide adequate allotment and care the environment. Diseases connected to skin, respiratory, intestinal, immune, endocrine and nervous systems as well as cancers can be prevented by appropriate organization along with removal of unwanted electrical waste.

According to peeranart kiddee et al. (2013) e-waste management is done by using safe methods in the case of recover and recycle materials. Combination of many tools can be used to solve the issue related to waste management.

In Sukeshini Jadhav (2013) experimented to facilitate, manufactures have the responsibility for adopting guidelines for manufacturing sound environment product. Manufactures should also try and set off a take back plan to handle the e waste. So that proper management and disposal of e- waste can be done.

Hassan Taghipour et al. (2012) suggested extending producer responsibility program and providing training programmes at various levels of society. The agency of ministry for health and environmental protection be supposed to rigorously manage electrical waste gathering, accumulation, recycling and discarding.

UNEP (2010) information predicts that in India the wastes from old computers will raise to 500% by 2020. As of discarded mobile phone, telephone, refrigerators will raise the e-waste. RE Hester, RM Harrison (2009) states that electronic squander incorporates such things as Televisions, PCs, LCD and Plasma showcases, and Cell phones, just as a wide scope of family unit, restorative and modern gear which are essentially colossal and developing amount of waste are disposed of consistently and this waste contains harmful and cancer-causing mixes which can represent a hazard to the earth.

Be that as it may, whenever dealt with effectively, electronic waste exhibits a significant wellspring of auxiliary crude materials.

III. OBJECTIVES

For the purpose of the study, the following objectives are to be taken:

- 1) To understand the awareness of e-waste among household consumers in Kanjoor, Ernakulam.
- 2) To analyze the e-waste disposal practices among household consumers in Kanjoor, Ernakulam.

STATEMENT OF THE PROBLEM

E-waste management is an effective way for removing electronic wastes from the environment. Recycling can be done through the various processes. The household consumers in Kanjoor are unable to dispose scrap items due to the unavailability of recycling plant and a proper collection centre. So the study was conducted to cram the electrical waste handling among household consumers in Kanjoor, Ernakulam.

IMPORTANCE OF THE STUDY

The study focuses on an emerging environmental and administrative challenge faced by economies across the world, which is disposal of electronic waste. Scientific e-waste management eliminates the dangerous toxins such as battery, lead, copper, etc. which damages air, water, soil and dangerous to health also. Electronic waste can decrease the requirement for removal of metals and drop off greenhouse gas emission from materials sourced directly from nature in their raw form. So there should be awareness among the common people about e-waste, its hazards and proper disposal methods.

CONCEPTUAL FRAMEWORK

E-Waste or E Scrap is the process whereby the waste of obsolete non-securable and lifeless electronic items are dumped off. This kind of waste majority contains metals which are perilous to the environment such as led, cadmium, etc. Many people in India are not aware of the methods followed for disposing these waste, hence the amount of electronic wastes are rapidly growing in the country. The main reason behind this sudden increase is because numerous number of people started using electronic gadgets and are discarded off because of their short life span. These e-waste contain huge amount of metals which are hazards and plastic too, this can pose as a thread to the people who handle e-waste. This will also put forward a peril to the environment, especially if people are unaware of the ramifications involved. So there rises an increasing demand

to analyse the health risks involved to reduce the increasing threat among electrical and electronic waste.

In our country, the amount of “e-squander” or electronic waste has now turn into a significant crisis. E-waste or waste electrical and electronic gear (WEEE) are cast out, excess, old, damaged, electrical or electronic gadgets. In our country the vast majority of the unwanted electronic belongings are deposit apart from families as they don't have a clue by means of organizing them off. This constantly growing squander is incredible in environment as well as a rich fountainhead of ore, for example, bullion, silver and

violation of this act or informed rules shall be punishable. chestnut which can be recuperated and carry so e- squander swap over and reusing collusions provide employment to several groups of persons in India. Just about 25,000 labourers incorporating kids are connected with crude dismantling entity in Delhi only where 10,000- 20,000 heaps of electronic squander is dealt with constantly by bare hands. Inappropriate spoiling and adapting of electronic squander turn into dangerous to life security including our biological system. Subsequently, the require of legitimate e-squander the executive have figured it out. It is significant to review the broad benefit threats and techniques to conflict this rising peril.

The simply way to condense e-waste is to recycle them. Since there are only a few organised facilities available, the majority of the people works in unorganised for a meagre income, often not trained and know how to handle the e-waste.

The “Polluter Pays Rule” was implemented in the Environmental (Protection) Act 1986 to compose the event accountable for creating contamination liable for paying the injure done to the natural surroundings. It is listed in rule 16 of the Rio Declaration on surroundings and growth. Polluter pays is also regarded as the obligation of comprehensive producers. Below the 1986 Environment (Protection) Act, Federal and State governments may pass laws to protect the atmosphere and persons from contact to toxic or dangerous waste. Any

Methods for disposal of e waste

As of now there are three fundamental transfer techniques are tailed:

Incineration: this is an illicit way for arranging electronic squander as well as it includes explosion of unwanted wastes at tremendous hotness in exceptionally structured heater. This e-waste shift technique is very invaluable as the waste amount is diminished incredibly a lot and the energy acquired is also used separately. Notwithstanding, it is also not free from drawbacks through discharge of the insecure gases mercury and cadmium in the earth.

Acid baths: it includes dousing of the electronic systems in the amazing sulphuric, hydrochloric or nitric corrosive preparations that handout the minerals in distinction to electronic path ways. The recuperated mineral is utilized in the assembling of different substances as the risky corrosive squander discovers its courses in the neighbourhood stream origin.

Landfills: this is the renowned strategy of electronic waste transfer. Soil is excavated and channels are prepared for layering e-waste in it. Furthermore, impenetrable inside layer is made of dirt or synthetic with a drain ate bowl for assortment and moving the e waste to the management set. Notwithstanding, landfill, isn't ecologically stable procedure for arranging off the electronic waste as lethal objects like cadmium, drove, and mercury are discharged within the dirt and groundwater.

IV. RESEARCH METHODOLOGY

RESEARCH DESIGN

This research includes exploratory research design. The exploratory research comprises the steps such as literature review, finalization of objectives, classification of variables, the formulation of hypothesis, etc.

Through out the second phase of examination, the conclusive research design was used, and this phase includes mutually descriptive research design and the causal research design. The descriptive research design was used to explain the characteristics of the population. It commonly means that obtaining information by using questionnaire, personal interviews and observation. It uses qualitative and quantitative methods to analyse one or more variables. The casual research design was carried out to find the casual relationship among the variables.

SAMPLING

Sampling is used to calculate approximately the uniqueness of the whole people from a statistical population. And it is the selection of a subset of individuals.

SAMPLING DESIGN

The population of the study comprises peoples who are using household products. The systematic sampling technique was used in this study for the collection of first hand information. In total, 104 samples were used for data analysis.

TYPES OF SAMPLING

Samplings are grouped into eight main categories and they are Deliberate, Simple Random, Systematic, Stratified, Quota, Cluster & Area, Multi-stage, Sequential.

Deliberate sampling is otherwise titled as purposive or non-probability sampling. It is the purposive or planned drafting of specific entity of the earth.

Simple random sampling is recognized as chance sampling or probability sampling where all the items in the residents has an equal opportunity of addition in the selection and has same chance of being chosen.

Systematic sampling always carries an part of unpredictability in sampling by means of casual figures to choose the unit. It is helpful when selection framework is given in the catalogue format.

Stratified sampling is dividing the population into groups called strata, based on the simple random sampling. In this sampling, samples are collected from each stratum.

Quota sampling is a significant type of non probability sampling. These selections are usually judgment samples preferably random samples. Range of the quota for every layer is comparable to the volume of that layer in the community.

For inclusion of sample, cluster sampling includes alignment of the population, selecting the groups or the clusters in lieu of using singular basics.

Area sampling divided the entire field into a numeral minor areas. Then these areas are arbitrarily chosen and included in the sampling. It much better where the record of population is absent.

Multi-stage sampling is the expansion of the plan of cluster sampling. In this the prime phase is to choose huge elementary sampling entities like states, districts, towns and finally families in the town. The sampling method is characterized as multi- stage random sampling when the approach of random sampling is practiced at all phases.

In Sequential sampling the volume of the selection is not set in advance. It set on on the ground of data giving review development.

SAMPLING UNIT

Sampling unit is a singular value within a sample database. Perhaps it is geological like as state, village, district etc. or building units for eg. house, flat etc. or possibly a community or a person a researcher has to settle on one or more such units for his study.

SAMPLING FRAME

List of sampling units is recognized as frame or sampling frame. In case of finite universe this includes the names of all objects of a universe. Such a file should be specific, exact, true, certain and apt. It is the main resource material from which a section is drawn.

SAMPLING METHOD

It means how a sample is selected from a given population. So the primary data is currently based on the first hand information collected through a well-defined questionnaire. The questionnaire consists of 6 general questions and remaining relating variables to be studied. The criteria for the selection of variables are purely based on the topic of the research paper. The respondents were asked to state their perception on each question, using the available options provided. The study also uses secondary data from various sources such as journals, websites, magazines, newspapers, etc.

TOOLS FOR DATA COLLECTION

The gathered data has been tabulated and analyzed through statistical software SPSS 21.0. The statistical tools used were Pearson chi-square test and ANOVA test. This tool helps to make appropriate conclusion for the study.

ANALYSIS AND INTERPRETATION

The overall way of disposal method of e-waste is shown below:

Method	No. of respondents	Percentage
used to throw them in the dustbin along with other garbage	6	5.6%

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I refer to the user manual of the electronic gadget to see instructions to safely dispose them off	18	16.7%
I do not mind giving it to junk or scrap dealer for few bucks	50	46.3%
Don't really bother, whatever comes to my mind at that time	8	7.4%
I care for the environment, but don't know about the disposal of E-waste	26	24.1%

In this table, it is apparent that the most of the respondents are saying that they do not mind giving it to junk or scrap dealer for few bucks.

In this table it shows the electronic devices that the respondents discarded in the last 5 years

Items	No. of respondents			
	0	1	2	3
Fridge	61	26	12	9
Washing Machine	62	27	13	6
TV	47	34	16	11

From the above table it is obvious that the respondents using fridge and washing machine for 3-4 years maximum. But the consumption of waste is more while taking TV.

CHI-SQUARE TEST

AGE

Null hypothesis (Ho) There is no association between age and awareness of hazards

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.931 ^a	4	.748
Likelihood Ratio	2.552	4	.635

Linear-by-Linear Association	.011	1	.917
N of Valid Cases	104		

Table value Table value for degree of freedom at 5% level of significance is 3.357.

Interpretation As the P value = 0.748 which is less than the table value so, Ho is rejected.

Inference There is a significant association between the age of the respondent as well as their awareness level.

GENDER

Null hypothesis (Ho) There is no association between gender and awareness of hazards

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.623 ^a	1	.430		
Continuity Correction ^b	.309	1	.578		
Likelihood Ratio	.622	1	.430		
Fisher's Exact Test				.489	.289
Linear-by-Linear Association	.617	1	.432		
N of Valid Cases	104				

Table value Table value for degree of freedom at 5% level of significance is .455.

Interpretation As the P value = 0.430 which is less than the table value so, Ho is rejected.

Inference There is a significant association between the gender of the respondent as well as their awareness level.

QUALIFICATION

Null hypothesis (Ho) There is no association between qualification and awareness of hazards

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.471 ^a	5	.361
Likelihood Ratio	5.441	5	.365
Linear-by-Linear Association	2.879	1	.090
N of Valid Cases	104		

Table value Table value for degree of freedom at 5% level of significance is 4.351.

Interpretation As the P value = 0.361 which is less than the table value so, Ho is rejected.

Inference There is a significant association between the qualification of the respondent as well as their awareness level.

OCCUPATION

Null hypothesis (Ho) There is no association between occupation and awareness of hazards

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.113 ^a	5	.402
Likelihood Ratio	6.406	5	.269
Linear-by-Linear Association	.012	1	.913
N of Valid Cases	104		

Table value Table value for degree of freedom at 5% level of significance is 4.351

Interpretation As the P value = 0.402 which is less than the table value so, Ho is rejected.

Inference There is a significant association between the occupation of the respondent as well as their awareness level.

INCOME

Null hypothesis (Ho) There is no association between income and awareness of hazards

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.608 ^a	4	.962
Likelihood Ratio	.650	4	.957
Linear-by-Linear Association	.269	1	.604
N of Valid Cases	104		

Table value Table value for degree of freedom at 5% level of significance is 3.357.

Interpretation As the P value = 0.962 which is less than the table value so, Ho is rejected.

Inference There is a significant association between the income of the respondent as well as their awareness level.

LOCATION

Null hypothesis (Ho) There is no association between location and awareness of hazards

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.576 ^a	1	.209		
Continuity Correction ^b	1.045	1	.307		
Likelihood Ratio	1.577	1	.209		
Fisher's Exact Test				.248	.153
Linear-by-Linear Association	1.561	1	.212		
N of Valid Cases	104				

Table value Table value for degree of freedom at 5% level of significance is .455.

Interpretation As the P value = 0.209 which is less than the table value so, the null hypothesis is rejected.

Inference There is a significant association between the location of the respondent as well as their awareness level.

ANOVA

AGE

Null hypothesis (Ho) There is no association between age and disposal method

ANOVA

disposal method

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.249	4	.312	.219	.927
Within Groups	140.905	99	1.423		
Total	142.154	103			

Interpretation: As the P value 0.927 which is greater than 0.05 so, Ho is accepted.

Inference: There is no significant difference between the age and disposal method, it may be due to some other factors.

GENDER

Null hypothesis (Ho) There is no association between gender and disposal method

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ANOVA

disposal method

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.933	1	1.933	1.406	.238
Within Groups	140.221	102	1.375		
Total	142.154	103			

Interpretation: As the P value is 0.238 which is greater than 0.05 so, Ho is accepted.

Inference: There is no significant association between the gender and disposal method, it may be due to some other factors such as character, behavior, etc.

QUALIFICATION

Null hypothesis (Ho) There is no association between educational qualification and disposal method

ANOVA

disposal method

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.830	5	.966	.689	.633
Within Groups	137.324	98	1.401		
Total	142.154	103			

Interpretation: As the P value 0.633 which is greater than 0.05 so, Ho is accepted.

Inference: There is no significant association between the educational qualification and disposal method; it may be due to some other factors as from books, social media, etc.

OCCUPATION

Null hypothesis (Ho) There is no association between occupation and disposal method

ANOVA

disposal method

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.835	5	.967	.690	.632
Within Groups	137.319	98	1.401		
Total	142.154	103			

Interpretation: As the P value 0.632 which is greater than 0.05 so, Ho is accepted.

Inference: There is no significant association between the occupation and disposal method, it may be due to some other factors such as hobby, role in society, etc.

INCOME

Null hypothesis (Ho) There is no association between income and disposal method

ANOVA

disposal method

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.091	4	.523	.369	.830
Within Groups	140.063	99	1.415		
Total	142.154	103			

Interpretation: As the P value 0.830 which is greater than 0.05 so, Ho is accepted.

Inference: There is no significant association between the income and disposal method, it may be due to some other factors such as standard of living, way of spending, etc.

LOCATION

Null hypothesis (Ho) There is no association between location and disposal method

ANOVA

disposal method

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.594	1	.594	.428	.514
Within Groups	141.560	102	1.388		
Total	142.154	103			

Interpretation: As the P value 0.514 which is greater than 0.05 so, Ho is accepted.

Inference: There is no significant association between the location and disposal method, it may be due to some other factors such as culture of the peoples, beliefs, etc.

V. FINDINGS AND SUGGESTIONS

FINDINGS

The majority of the respondents are female, graduates and are salaried persons. This indicates that most of the respondents are well educated. In this study, women were playing major roles it might be the reason that they spend more time in house rather than males.

The study shows that, majority of the respondents purchase electronic products occasionally considering brand as a major factor. Most of the respondents exchange their products to buy a new one. They sell the old product to scrap dealer or sell as second hand after purchasing the new product. Damaging of the product make most of them to change using current product. The price of the repair product compared with replacing, is the major factor which affect the choice whether to repair an object or not. So they do not mind giving it to the junk or scrap dealers for few bucks. The rag pickers collect waste from house once in a month.

The majority of the respondents are aware of the hazards or negative effects of wastes, if it is not handled carefully and chemicals present in the electronic product. So 95% of the respondents were willing to pay for a green product.

VI. SUGGESSTIONS

- Stop buying things which you don't use mostly.
- Organize the things which you having in your home, thereby we can control the production of E-waste by purchasing more electronic gadgets.
- Donate the things that you no longer use helps to reduce E-waste generation.
- If any damages then take them back to the store.
- If you purchase a product due to upgradation of technology then sell the old product that you not using to OLX and eBay, are some of the best places to sell your products.
- Recycling centers are essential for minimizing the waste and government should setup at least one recycling center, where huge production of e-waste occurs.
- Most of the peoples buy products for their needs. Instead of buying, rent the products that we actually need.
- Everyone should learn how to repair the products from their home itself. So there by we can reduce the chances of selling products to scrap dealers and buying a new one.
- Buy quality products such as products with high energy star and certified products, which are less harmful and environment friendly.
- Individuals should prefer more recyclable products.
- Peoples should execute how to handle e-waste properly regarding to the rules.

VII. CONCLUSION

This study was conducted on the aim of analyzing the problems faced by the population of Ernakulam district in Kerala for managing the e-waste generation. The study generally paying attention to the handling of the household e-waste products at Kanjoor Panchayath. We are taking TV, Fridge and Washing Machine for our study because it considered as a valuable element in our day-to-day life. The peoples are aware of the hazards and after effect of wrong disposing of e-waste but asking more about it they are not much aware about the hazards. The study recommends that government should provide awareness campaigns regarding the hazards and its effects. And include e-waste, negative effects and the proper way for handling e-waste in curriculam. Government should take proper methods and setup a recycling center in Kerala. Peoples are showing their interest on green products, so making available of green products should be more beneficial.

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