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E-Waste Awareness among Households in Kerala

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Abstract:

The idea of modernization seems to be inseparable from technological revolution in electronics, telecommunication and computerization all over the world. E-waste dismantling or incineration is considered toxic. They are targeted for reuse, recovery or hazardous waste disposal for the recovery of metals. What is unknown to the general public is that many pieces of the electronic equipment consist of hundreds of component parts, many of them contain highly toxic metals and compounds such as lead, mercury, beryllium, and toxic chemicals, besides PVC-coated copper wire, which are virtual factories for producing the harmful toxin, dioxin when burnt.

The dangerous consequence of this is a new trend in the form of accumulation of e-waste, which are in a dilemma about cheap disposal of them. In fact there is no fool proof system in place to ensure that these e-wastes are safely disposed of. Hence, it is metaphorically said that the e-wastes are “plastic bags” of the future, practically unknown a decade ago but today not only litter the country sides landscape but also a potential threat to the ecosystem and environment. There is a need to analyse the awareness on these issues among households in Kerala. The paper attempts to study the same.

Keywords: *EEE, E-WASTE, WEEE, E-Waste Issues, E-Waste Disposal, E-Waste Management*

INTRODUCTION:

Electrical and Electronic Equipment (EEE) has become an essential part of everyday life. It has enabled global population to optimise communication, data management and electric home appliances make daily tasks easier to handle. While the COVID-19 crisis and the social distancing measures accelerated the digital transition. EEE comprises of diverse and complex components and materials including hazardous substances like lead, mercury, flame retardants, carbons etc. and valuable assets e.g., gold, copper, steel, aluminium etc. E-Waste is an ‘urban mine’, as it contains several precious, critical and non-critical metals that, if recycled, can be used as secondary materials. When computers or other electronic equipments become waste or useless or outdated, if not treated properly, hazardous substances can pollute environment and damage human health. EEE becomes e-waste once it has been discarded by its owner as waste without the intent of reuse (Step

Initiative 2014). Waste Electrical and Electronic Equipments (WEEE) is one of the fastest growing waste streams in the world. Improper management of e-waste contribute to global warming. E-Waste management closely relates to many Sustainable Development Goals (SDGs), such as SDG 8 on decent work and economic growth, SDG 3 on good health and well-being, SDG 6 on clean water and sanitation and SDG 14 on life below water.

Objectives of the study:

To determine the awareness on E-Wastes Issues among the households in Kerala.

Research Methodology:

This paper intended to study and analyse the awareness among household customers of EEE regarding E-Waste and E-Waste Issues. For the purpose of the study both primary and secondary were used. Primary data were collected using structured interview schedule and secondary data were collected from published journals, articles, newspaper reports, thesis etc,

Households implies the residential consumers (having Electrified houses) using Electrical & Electronic Equipments in Kerala state. The study involved proportionate stratified random sampling. The strata for the study were organized as Districts, Taluks and Wards covering Municipal Corporation, Municipalities and Grama Panchayats in 3 districts of Thiruvananthapuram, Ernakulam and Kozhikode in Kerala. Random sampling was incorporated in the sample selection of municipal corporations, municipalities and grama panchayats and selection of wards in each segment of the Municipal Corporation, Municipality and the grama panchayat based on the condition that wards had the highest number of households as per data given in Census 2011.

Table 1: Sample Size Distribution

Classification	Trivandrum	Ernakulam	Kozhikode	Total
Municipal Corporation	109	101	93	303
Municipality	12	20	15	47
Grama Panchayat	16	14	5	35
Total	137	135	113	385

Primary data, census 2011

Result and Discussion:

Profile of the sample -

The sample of the study consists of 385 household consumers using Electrical and Electronic Equipments (EEE) selected at random from the state of Kerala. Demographic characteristics included in the study were family type, number of family members, location and place of living,

educational qualification, employment and monthly income. These socio-economic and demographic factors were analysed to understand the profile of household consumers and their e-waste management issues and challenges and the findings are discussed below.

Table 2: Distribution of sample by their Characteristics

Characteristics		n	%
Family type	Nuclear	221	57.40
	Joint	115	29.87
	Single	49	12.73
Number of family members	Less than 3 members	163	42.34
	3-5 members	132	34.29
	More than 5 members	90	23.38
Location of households	North	113	29.35
	Central	135	35.06
	South	137	35.58
Place of living	Urban	302	78.44
	Semi- Urban	48	12.47
	Rural	35	9.09
Educational Qualification	Primary	7	1.82
	High School	58	15.06
	Graduate	234	60.78
	Post-Graduation	86	22.34
Type of Employment	Government employee	59	15.32
	Private Employee	128	33.25
	Self- employed	125	32.47
	Professionals	73	18.96
Monthly Income	Less than Rs.50,000	49	12.73
	Between Rs. 50,001 - 75,000		
	Between Rs. 75,001- 100,000	134	34.81
	Above Rs. 100,000	46	11.95
	Total	385	100.00

Sources of learning about E-Waste

Table 3: Distribution of sample by sources of learning about E-Waste

Sources of learning about E-Waste*	n	%
Educational Institutions	8	2.09
Television	13	3.39
Print Media	95	24.8
Workplaces	88	22.98
Social Media	157	40.99
Local Awareness Programs	57	14.88

*Multiple responses

The table 3 shows the sources of learning about E-Waste by the household consumers of Electrical and Electronic Equipments. Highest number of respondents i.e. 41 percent were aware on e-waste through social media. 14.88 percent of Households got awareness about e-waste from local awareness programs. Television and Educational institutions were the least sources through which respondents aware about E-Waste.

Awareness on E-Waste Issues -

E-Waste, e-scrap and end-of-life electronics can be toxic, is not biodegradable and accumulates in the environment, in the soil, air, water and living things. For example, open-air burning and acid baths being used to recover valuable materials from electronic components release toxic materials leaching into the environment and causes human health badly.

Table 4: Awareness on the toxicity in Electrical & Electronic Equipments (EEE)

	n	%
Yes	81	21.04
No	304	78.96
Total	385	100.00

Table 4 shows the respondents awareness regarding the toxicity in Electrical & Electronic Equipments (EEE). Majority of household consumers, 78.96 percent are unaware about the toxicity in Electrical and Electronic Equipment. And 21.04 percent respondents are aware also.

Table: 5 Considering environmental problems associated with Mismanagement of E-Waste

	N	%
Very Serious	1	0.26
Serious	18	4.68
Not So	142	36.88

Serious		
Not a Problem	224	58.18
Total	385	100.00

Table 5 shows, how the households consider with the environmental problems associated with Mismanagement of E-Waste. Majority, 58.18 percent of respondents consider the environmental problems due to mismanagement of e-waste as not a problem. 36.88 percent of respondents are not so serious with the environmental problems associated with mismanagement of e-waste.

Table:6 Environmental Issues due to E-Wastes: -

		Highly Unaware	Unaware	No Opinion	Aware	Highly Aware	Mean	SD
Open burning of wires in damaged EEE emits hydrocarbons and ashes discharged into air, water and soil causes environmental damages.	n	45	174	10	104	52	2.85	1.31
	%	11.69	45.19	2.60	27.01	13.51		
Leakage of toxic by-products of EEE into nearby rivers and soil, which is then absorbed by plants, leading to poisonous food chain.	n	47	209	14	83	32	2.59	1.19
	%	12.21	54.29	3.64	21.56	8.31		
Removing and Burning computer chips from Printed Circuit Boards (PCBs) causes air emissions affects environment.	n	43	217	9	77	39	2.62	1.21
	%	11.17	56.36	2.34	20.00	10.13		
When refrigerants (cooling agents) in ACs, refrigerators etc. are broken it releases Chlorofluorocarbon gases (CFC's) into the sky causes 'global warming' , which is a major problem.	n	37	191	5	115	37	2.80	1.24
	%	9.61	49.61	1.30	29.87	9.61		

Table 6 shows, the awareness level of household consumers of electrical and electronic equipments regarding various environmental issues of e-waste. Among the total respondents 45.19 percent are unaware about the environmental damages due to Open burning of wires in damaged EEE emits hydrocarbons and ashes discharged into air, water and soil.

Leakage of toxic by-products of EEE into nearby rivers and soil, which is then absorbed by plants, leading to poisonous food chain causes environmental damages. 54.29 percent households are unaware and 21.56 percent are aware about this issue.

Removing and Burning computer chips from Printed Circuit Boards (PCBs) causes air emissions affects environment badly. Among the respondents, 56.36 percent are unaware.

When refrigerants (cooling agents) in ACs, refrigerators etc. are broken it releases Chlorofluorocarbon gases (CFC’s) into the sky causes ‘global warming’, which is a major problem to environment. 29.87 percent among the sample respondents are aware on this issue and 49.61 percent are unaware also.

Table: 7 Health Issues due to WEEE

	n	Highly Unaware	Unaware	No Opinion	Aware	Highly Aware	Mean	SD
Breaking of copper and dumping of Cathode ray tube in WEEE causes Silicosis , serious lung diseases.	n	49	234	10	71	21	2.43	1.10
	%	12.73	60.78	2.60	18.44	5.45		
Informal recycling and open burning of dismantled PCBs affects workers and nearby residents due to inhalation of toxic gases and chemicals.	n	40	220	10	85	30	2.60	1.17
	%	10.39	57.14	2.60	22.08	7.79		
Cobalt in EEE , results in vision problems, heart problems , causing asthma and pneumonia.	n	49	260	12	60	4	2.25	0.90
	%	12.73	67.53	3.12	15.58	1.04		
Germanium and Selenium in EEE causes harm to skin, eyes and severe health issues	n	60	197	9	119	0	2.49	1.09
	%	15.58	51.17	2.34	30.91	0.00		
Lead is more dangerous to human health such as anemia, kidney damage, disruption of nervous system, blood pressure, brain damage.	n	47	215	16	105	2	2.48	1.04
	%	12.21	55.84	4.16	27.27	0.52		
Poly Brominated Biphenyls (PBBs), in WEEE causes Immune system Abnormalities	n	25	204	16	135	5	2.72	1.06
	%	6.49	52.99	4.16	35.06	1.30		
Poly Brominated Biphenyls (PBBs), in WEEE causes Adverse birth Outcomes	n	39	178	18	145	5	2.74	1.11
	%	10.13	46.23	4.68	37.66	1.30		

Table 7 shows various health issues due to Waste Electrical and Electronic Equipment (WEEE). 60.78 percent of household respondents are unaware about the health issue due to breaking of copper and dumping of Cathode ray tube in WEEE causes Silicosis, serious lung diseases.

From the table it is clear that, 57.14 percent of total household customers of EEE, are unaware about the issue of informal recycling and open burning of dismantled PCBs affects workers and nearby residents due to inhalation of toxic gases and chemicals.

Cobalt in EEE, results in vision problems, heart problems, causing asthma and pneumonia due to improper disposal of e-waste. 67.53 percent of households are unaware on the toxic element of cobalt.

It is clear from the table, household customers' awareness level on the health issue due to Germanium and Selenium in EEE causes harm to skin, eyes and severe health issues is very poor, majority are unaware. 30.91 percent of respondents are aware about this health issue.

Another health issue due to lead is more dangerous to human such as anaemia, kidney damage, disruption of nervous system, blood pressure, brain damage. Majority of households are unaware on this health issue and 27.27 percent of households are aware.

Regarding the awareness level of households regarding the health issue due to Poly Brominated Biphenyls (PBBs), in WEEE causing Immune system Abnormalities, majority are unaware and 35.06 percent of total sample are aware.

Poly Brominated Biphenyls (PBBs), in WEEE causes Adverse birth Outcomes, respondents' awareness level shows that, 46.23 percent are unaware and 37.66 percent households are aware also.

Table: 8 special treatment before disposal of E-Waste

	N	%
Yes	264	68.57
No	121	31.43
Total	385	100.00

Table 8 shows the awareness of respondents on special treatments on E-Waste before its disposal. 68.57 percent of household consumers think that e-waste requires special treatment before disposal and 31.43 are unaware about the procedures before e-waste disposal.

Table: 9 Disposal of Unserviceable EEE / WEEE

	N	%
Dump in designated places	21	5.47
Throw in river side	0	0.00
Throw in road ways	4	1.04
Throw in landfills	9	2.34

Throw in empty plots	19	4.95
Dump in household itself	125	32.55
Burning/Incineration	48	12.50
Sell back to Manufacturer	0	0.00
Give to scrap dealers for few bucks	102	26.56
Give it as donation	9	2.34
Refer User Manual of the EEE, for the instructions of its safe disposal	0	0.00
Dispose it through exchange with new product	68	17.71
Care for the environment, but don't know how to dispose E-waste.	62	16.15

Primary data Multiple responses

Table 9 shows different ways of disposal of Waste Electronic Equipment or unserviceable EEE by the household customers. Among the sample respondents, 32.55 percent dump their WEEE in the house itself and 26.56 percent give it to scrap dealers. 17.71 percent of sample respondents dispose their e-waste through exchange with new product, 16.15 percent respondents care for the environment, but don't know how to dispose E-waste. Among the total households, 12.50 percent dispose their waste EEE through Burning/Incineration, 5.47 percent households Dump WEEE in designated places, 4.95 percent dispose e-waste by throwing in empty plots, 2.34 percent dispose their waste throwing for landfills and give it as donation. 1.04 percent respondents also opined that they dispose their waste EEE in roadways.

Conclusion:

E-waste is one of the rapidly growing environmental problems in India, the improper handling of which harms people and the ecosystem. There is E-Waste (Management) Rules 2016; and Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, published by Government of India Ministry of Environment, Forest and Climate Change (MoEFCC) to govern this hazardous issue. There is a need to implement and frame policies for proper E-Waste management in Kerala so as to solve various issues related with such wastes. The need for developing a legal framework for the management of this waste fraction is one of the challenges for the policy makers.

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