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A Study on the Disposal Patterns and Awareness of Waste Electrical and Electronic Equipment in Chennai

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ABSTRACT

Purpose: The purpose of the study is to assess the level of consumer's knowledge and awareness towards the disposal of electrical and electronic waste in the study area. **Design and Methodology:** A user of mobile phones, laptops and television were selected as a sample respondent of the study and the convenience sampling method was adopted to select 100 sample respondents in Chennai city. The collected data were analysed by using Statistical tools like f-test, t-test and Chi-square analysis. **Findings:** The study revealed that there is significant variation in the awareness about the effect of WEEE on the basis of sex, educational levels and also monthly income of the sample respondents. The replacement of a mobile phone was less than a year in comparison to the other two gadgets. Of the three gadgets, mobile phones have been serviced the most before discarding. It can be noted that the respondents discard the gadgets only when it is. The study revealed that the majority of the respondents disposed batteries along with municipal waste. **Scope for Further Research:** This topic offers wide scope in the areas of waste minimization and management which would help waste management. Studies can be initiated by both governmental and non-governmental organizations for a better understanding of the WEEE problem. Livelihood issues of the informal sector and the need for formal recycling units can be probed. Environmental awareness and involvement in various environmental initiatives among various age groups can be examined.

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1.0 INTRODUCTION

Electronic gadgets have become an integral part of every household. Demand for television, refrigerators and modern communication technologies have given impetus to the electronics industry. Increasing consumption patterns of people and the overuse of resources has brought into focus the Throwaway culture. Zhang (2022) attributed that rise in environmental issues is due to Throwaway society and identifies use of plastics, emergence of food waste, digital waste and Planned Obsolescence are issues that need to be addressed to reduce environmental impact.

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The fifth aim of the Sustainable Development Goal (SDG) for the year 2030 is to decrease the quantity of waste. SDG 12 is concerned with promoting sustainable consumption and production, and its goals include prevention, reduction, recycling, and reuse. Waste Electrical and Electronic Equipment (WEEE) has led to the emergence of dumping destinations and dismantling units in LDCs. There are in numerous informal recycling units across the world and in India that adopt crude methods in dismantling WEEE due to availability of cheap labour and low recycling costs. India is one of the major dumping destinations for WEEE. E-waste from other countries enters India through the Ports of Mumbai, Kolkata and Chennai.

Many brands of electronic gadgets realizing the problem of e-waste have taken initiatives such as take-back scheme for their old and end-of-life gadgets. Issues pertaining to environmental, health, safety, role of industry initiatives, Extended Producer Responsibility are crucial. Legislations and conventions such as Basel Convention, EU Directive, Restriction of Hazardous Substances (RoHS) and Registration, Evaluation and Authorization of Chemicals (REACH) are in force in many countries.

1.1 Waste Management in India

Classification of waste into household waste, toxic, electronic waste has led to development of alternatives to minimize each type of waste. In order to understand the problems of e-waste there is need to comprehend the solid waste management. The stress on solid waste management is crucial as the Surat Plague of 1994 is a reminder that negligence in solid waste management could be devastating to any economy. Unsafe waste disposal methods cause a range of social costs including health hazards. According to the findings of several studies, around ninety percent of Municipal Solid Waste (MSW) is disposed improperly at open dumps and landfills, which causes issues for public health and the environment. Industrialized States like Maharashtra, Gujarat, Andhra Pradesh and Tamil Nadu face major problems relating to toxic and hazardous waste. A lack of facilities for waste management and the lack of regulations for the take-back of end-of-life products or the execution of Extended Producer Responsibility (EPR) are among the most significant challenges faced by developing countries.

Table 1

India E-Waste Generation

Financial Year	Generation (Tonnes)
2017-18	7,08,445
2018-19	7,71,215
2019-20	10,14961.2

Source: Choubey (2022)

Table *1* reveals that there has been a steady rise in the generation of e waste in India over the three financial years. In India most of the e-waste is handled by the informal recyclers and the formal recycling units are underutilized. According to the Forti *et al.,* (2020), India is the third biggest producer of e-waste after China and the United States of America.

1.2 Review of Literature

Japan International Co-operation Agency (2004) has found that households in Delhi with low income generate the least quantity of waste in comparison to middle and higher income groups. Items like plastics, glass, iron scraps, milk sachets and newspapers are generally sold to waste purchasers referred to as kabadiwalas. As income increases, people abandon their behaviour of segregating

waste and tend to discard all waste along with household waste. Gupta (2004) addressed the issue of livelihood opportunities to people involved in waste collection (popularly known as rag pickers) in developing countries like India. A substantial percentage of population earns their livelihood through waste. People are involved in various types of work like waste picking, sorting, recycling, door-to-door collection, composting, recovery and recycling. Ramachandra and Varghese (2004) have suggested options to industries to tackle waste such as "inventory management, production process modification, volume reduction, recovery and reuse." Sustainable product design is suggested as an alternative to minimize the amount of hazardous waste. Oates *et al.,* (2018) analysed how the organization Self Employed Women's Association (SEWA) in Ahmedabad is involved in collection and segregation of waste in households. The study has estimated that there has been an efficiency in waste collection of 70 per cent. The study revealed that 90 per cent of the waste in India is dumped in Public Places.

The literature and importance on e-waste issue has evolved over a period of 33 years starting from the Basel Convention in 1989. Empirical studies have evaluated the costs and benefits in waste management. This study analyses the consumer awareness and behaviour in the disposal of WEEE with reference to three EEE gadgets. The study would also foray into WEEE stored in households.

1.3 Scope of the Study

This study offers wide scope in the areas of waste minimization and management which would help waste management. Studies can be initiated by both governmental and non-governmental organizations for a better understanding of the WEEE problem. Livelihood issues of the informal sector and the need for formal recycling units can be probed. Environmental awareness and involvement in various environmental initiatives among various age groups can be examined.

1.4 Objectives of the Study

1) To study about Waste Electrical and Electronic Equipment (WEEE) globally and in India.
2) To assess Consumer Knowledge and awareness levels in the disposal of Waste Electrical and Electronic Equipment (WEEE) in the study area, Chennai.
3) To analyse the types of WEEE gadgets stored in the households.

1.5 Hypotheses of the Study

- **H_1:** There is significant variation among respondents on the level of awareness in the disposal of WEEE.
- **H_2:** Opinions regarding the storage of WEEE products in the residence of the households is not equal to the average level.
- **H_3:** There is no association between the reasons for the replacement of electronic gadget and their Educational Status.

2.0 METHODOLOGY OF THE STUDY

The research makes use of primary as well as secondary data sources. Books, journals, and magazines were studied for reports and other forms of secondary data and a well-structured questionnaire were used as a primary source of data. A user of mobile phones, laptops and televisions were selected as a sample respondent of the study and the convenience sampling method was

adopted to select 100 sample respondents in Chennai city. The collected data were analysed by using Statistical tools like f-test, t-test and Chi-square analysis.

3.0 DATA ANALYSIS AND INTERPRETATION

Table 2

Classification of Demographic Factors

Demographic Factors	Frequency	Total
Gender		
Male	43	100
Female	57	
Age		
<25	24	
25-35	32	
35-45	15	100
45-55	20	
>55	9	
Educational Status		
UG	20	
PG	36	100
Higher Secondary	44	
Monthly Income		
<15k	55	
15k to 30k	20	100
30k to 45k	15	
>45k	10	

Source: Data compiled from the field survey

Table *2* shows the demographic factors. Demographic factors which include gender, age, educational status, and monthly income respondents of the respondents.

3.1 Testing of Hypotheses

- **H_1:** There is significant variation among respondents on the level of awareness in the disposal of WEEE.

Table 3

Testing the Variation in the Awareness about the Effect of WEEE on the basis of Sex, Educational Levels and Monthly Income of the Sample Respondents

Variable	Variation	Sum of Squares	Mean Square	F-value	Sig.
Sex	Between Groups	4.840	4.840	24.586*	0.000
	Within Groups	78.350	0.197		
	Total	83.190			
Educational Levels	Between Groups	0.562	0.562	18.161*	0.004
	Within Groups	70.815	0.178		
	Total	71.378			
Monthly Income	Between Groups	9.610	9.610	45.110*	0.000
	Within Groups	79.500	0.200		
	Total	89.110			

Note: * Significant at 1%

Source: Data compiled from the field survey

The results shown in Table *3* suggest that the calculated F-values are statistically significant at 1 per cent level in all three cases and thus, the null hypothesis is failed to accept. And therefore, H_1 is accepted.

Hence, it is concluded that there is significant variation in the awareness about the effect of WEEE on the basis of sex, educational levels and also monthly income of the sample respondents.

3.1.1 Opinion Regarding the Storage of WEEE Products among Respondents

- **H_2:** Opinion regarding the storage of WEEE products the households are not equal to the average level (3)

Table 4

T-test for Specified Value (Average =3) the storage of WEEE products in the households among respondents are not equal to Average Level

Storage of WEEE	Mean	SD	t-Value	p-Value
Kitchen Appliances	4.21	.537	21.186	0.000**
Printer	2.13	.610	17.958	0.000**
Washing Machine	2.10	.706	13.547	0.000**
Mobile Chargers	4.55	.664	15.235	0.000**
Headphones	2.11	.755	12.489	0.000**

Source: Data compiled from the field survey

Note: ** Significant at 1%

Since p-value (as shown in Table *4*) is less than 0.01, the null hypothesis is failed to accept at 1% level of significance with regard to all the statements on the storage of WEEE products in the households and hence H_2 is accepted. Based on mean score, opinion regarding to all the statements were above the average level and below average level, it indicates that the Kitchen appliances and Mobile Chargers are disposed; Printers, washing machine and Headphones were stored in the households. A study conducted by the United Nations Institute for Training and Research (2022) revealed that five kilos of e-devices per person are hoarded in the average European family.

3.1.2 Association between Reasons for Replacement of Electronic Gadgets and the Educational Status of the Respondents

- **H_3:** There is no association between the reasons of replacement of electronic gadget and their Educational Status

Table 5

Reasons for Replacement of Gadgets

S.No	Reasons for replacement	Chi-Square Value	p-Value
1	Outdated	3.156	0.000**
2	Beyond repair	9.12	0.000**
3	New Models and features	5.32	0.000**

Source: Data compiled from the field survey

Note: ** Significant at 5%

Since p-value is less than 0.05, (as shown in Table *5*) the null hypothesis is failed to accept at 5% level of significance and therefore, H_3 is accepted. Hence it is proved that there is an association between the reasons of replacement of electronic gadget and their Educational Status. As there is

Planned obsolescence for gadgets it is inevitable for the consumers to switch over to gadgets with better features.

4.0 MAJOR FINDINGS

The three gadgets namely mobiles, laptops and television undertaken for the study revealed the following:

- The replacement of a mobile phone was less than a year in comparison to the other two gadgets.
- Of the three gadgets, mobile phones have been serviced the most before discarding.
- The expenditure incurred in servicing the three gadgets ranges from less than ₹5000 to more than ₹20,000. It can be noted that the respondents discard the gadgets only when it is beyond repair.
- 65.7 percent recognized the WEEE symbol and 34.3 per cent were unable to recognize the symbol.
- The study revealed that majority of the respondents disposed batteries along with municipal waste.
- The respondents opined that there was no proper collection mechanism for WEEE.

5.0 SUGGESTIONS

- People should be made more aware of the environment by conducting rallies, advertising campaigns, and seminars to demonstrate the effects of WEEE thrown away with everyday waste and how crucial it is to manage e-waste.
- Moulding the attitudes of people in efficient usage of EEE gadgets would lower the carbon footprint and also prolong the life of the gadget. This would prevent them from entering landfills.
- People need to be encouraged to properly dispose of their WEEE via the organisation of collection campaigns and the availability of sufficient drop-off spots.

6.0 CONCLUSION

The study highlights the nature of disposal behaviour among the respondents and their awareness levels relating to WEEE. Users can play a significant role in resolving the WEEE problem by purchasing eco-friendly electronics and disposing of EEE devices properly. Users of EEE devices should be encouraged to practice the 3Rs (Reduce, Reuse, and Recycle) to reduce the amount of electronic trash that ends up in landfills. Rather than using the usual “cradle to grave” strategy, which would hurt the environment, focusing on ideas such as “cradle to cradle” would have a positive effect. Solutions that address all the stakeholders- Consumers, manufacturers, Formal and informal recyclers need to be stressed. Electronic waste management in India is requires multi-pronged initiatives addressing all the stakeholders.

6.1 Limitations of the Study

1. The study is limited to Chennai city only.
2. The research is based on only 100 responses.

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