

A Study on Awareness on Electronic Waste

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Abstract

The issue of E-waste has constrained Environmental offices of numerous nations to enhance, create and receive ecologically solid alternatives and systems for E-waste administration, with a perspective to relieve and control the constantly developing danger of E-waste to the earth and human wellbeing. E-waste administration is given the top need in numerous created nations, however in fast creating nations like India, it is hard to totally receive or imitate the E-waste administration framework in created nations because of numerous nation particular issues. The paper deals with the awareness and attitudes of regular consumers of electronic goods as well as the sellers in respect to e-waste management. It aims to study the factors that affect awareness and determine the social involvement of citizens with regard to the issue of e-waste disposal. Certain relationships such as: education level, gender, attitude towards recycling has been analysed. The study involves students aged between 21-30 years and retailers in the markets of Sec-22 & Sec-35 of Chandigarh. Judgemental as well as convenience sampling has been used. The frequency distribution has been used to analyze the profile of respondents.

I. Introduction

Electronic waste ordinarily known as e-waste is the name given to all electronic and electrical machines which are toward the end of its life. E-waste in short is a term snuggles different types of electric and electronic contraption that have stopped to be of any worth to their proprietors. E-waste is a wide and developing scope of electronic gadgets ranges from expansive family types of gear (coolers, aerates and cools, phones, individual stereos) and buyer hardware to PCs that have been disposed of by the clients. Electronic waste especially computer waste is growing exponentially in volume because of increasing demand of information technology and its application in the national growth process.

E-waste stances direct wellbeing dangers when it corrupts and inner chemicals are discharged to the earth. Figure-1 shows e-waste management systems and their potential hazards. Lead and mercury are exceedingly powerful neurotoxins, especially among youngsters, who can endure IQ inadequacy and formative variations from the norm even at low levels of presentation. Cadmium, a lethal metal found in circuit board, is recorded by EPA as a "plausible human cancer-causing agent", furthermore delivers aspiratory harm when blazed and breathed in. Hexavalent chromium, likewise utilized as a part of circuit sheets, has been found to deliver sinus and tumors in lungs when breathed in at high measurements. Notwithstanding metals in gadgets, numerous naturalists stress that the brominated fire retardants (BFR) in plastic represent a wellbeing hazard [1].

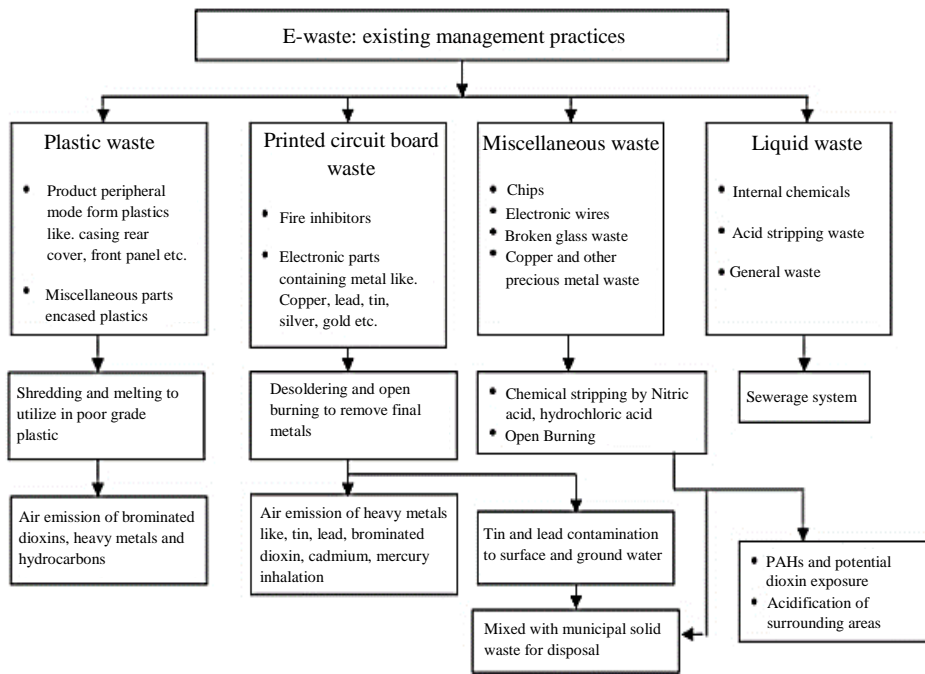


Figure 1: Existing e-waste management systems and potential hazards [1]

The India's E-waste management system is not formally developed. Moreover it is very ill defined and unorganized. The Figure 2 presents the schematic overview of physical and financial flows of EEE in India.

Policy Level Legislations in India: In view of the ill-effects of hazardous wastes to both environment and health, several countries exhorted the need for a global agreement to address the problems and challenges posed by hazardous waste. However, the policy level initiatives regarding e-waste in India is quite rudimentary and needs immediate attention. Following are some of the policy level initiatives in India regarding e-waste.

- I. Under Schedule 3 [2], e-waste is be defined as “Waste Electrical and Electronic Equipment including all components, subassemblies and their fractions except batteries falling under these rules”. The definition provided here is similar to that of Basal Convention. E-waste is only briefly included in the rules with no detail description.
- II. The Guidelines for Environmentally Sound Management of E-Waste [3] was a government of India initiative and was approved by Ministry of Environment and Forest and Central Pollution Control Board. It classified the e-waste according to its various components and compositions and mainly emphasizes on the management and treatment practices of e-waste. The guideline incorporated concepts such as “Extended Producer Responsibility”.
- III. The e-waste Management and Handling Rules [4] have been notified in May 2011.
 - i. According to schedule-1, rules have been applied to every producer, purchaser, collection centers, dismantler and recycler of e-waste. The regulatory agencies involved are State Pollution Control Boards (SPCBs)/Pollution Control Committees (PCCs) and CPCB.
 - ii. The batteries management and handling rules, 2001 covers the lead acid batteries, Enterprises Development Act, 2006, include micro and small enterprises and radioactive wastes as enclosed under the Atomic Energy Act, 1962.
 - iii. Schedule 1 rules are implemented to all of the machinery and consumables used in all electrical and electronic equipment (EEE) manufacturing. The rules are also functional to all machinery and consumables, which are part of the product at the time of disposal.
 - iv. The rules also restrict the use of hazardous substances or used in reduced amount in electrical and electronic appliances. Based on these rules every electrical and electronic manufacturer have to ensure the devoid of metals and chemicals, which include

- specified ranges of lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls.
- v. In case of any product and industrial components with significant doubt, the decision will be taken by MoEF/CPCB with clarity through comparison with scheduled-I components.
 - vi. The apparatus used in the manufacture of electronic equipment is considered to be outside the schedule-1 rules but wastes from these machines have to be diverted to recycling facility till it has been fully recycled.

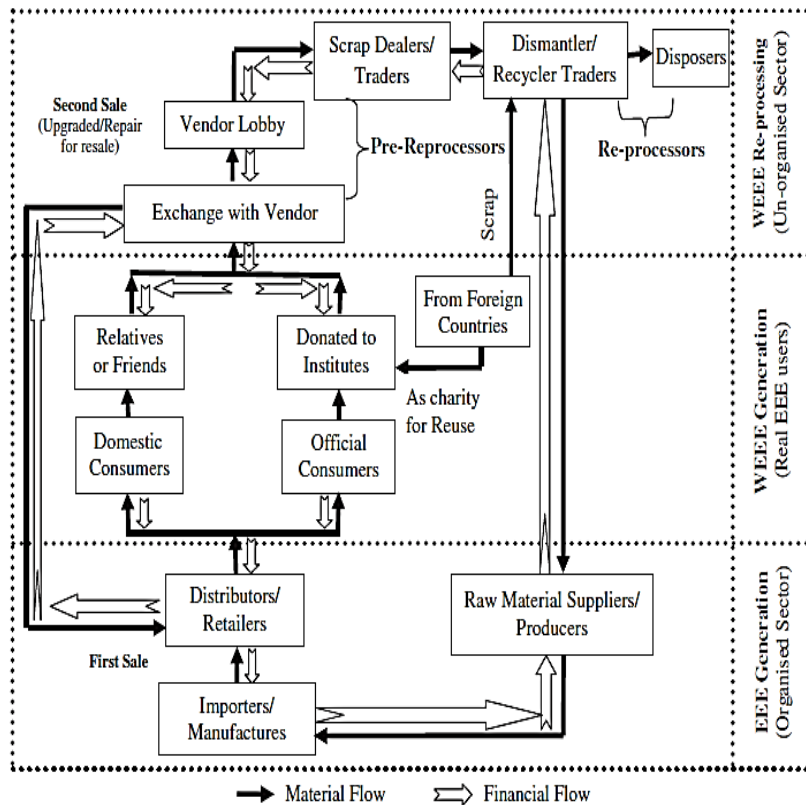


Figure 2: Schematic overview of physical and financial flows of EEE in India [5]

II. Related Work

Several studies have been conducted in India and abroad to understand the issue of e-waste and study about its awareness. Vijay Kumar Garlapati (2015), gave a functional audit of worldwide e-waste details, health issues of e-waste parts alongside the waste administration, reusing, authoritative polices and proposals identified with e-waste. Existing and future activities of e-waste administration have been tended to by clarifying the created nations' activities towards e-waste administration [6]. Anthony Okoye, Chijioke Odoh (2014), did a study to determine the people groups' level of familiarity with the control, their method of transfer of the e-squanders and their attention to the perils intrinsic in inappropriate taking care of and transfer of squanders [7]. Saritha V, Sunil Kumar, K.A. and Srikanth, V.N. (2014), attempted a study planned to affect a consciousness of manageability practices and supportability issues in the administration of E-waste, particularly squander identified with (PCs) and cell telephones. From the after effects of the study, they reasoned that there is a solid prerequisite for spreading mindfulness about the developing risk of E-waste [8]. Anuj Shah A, Dhakal T, Pandey T (2014), endeavoured an appraisal of open attention to the administration approaches and e-waste perils through individual meetings with Indian families in Ahmedabad. Understanding from government authorities, NGO delegates, and formal and casual e-waste preparing labourers were likewise looked for and it was found that most respondents don't take an interest in formal e-waste reusing frameworks, don't know particular details about the health and environmental hazards of e-waste, and do not know about the 2011 e-waste legislation [9]. E-Waste in India (2011), a report published by the Research Unit of Rajya Sabha explained in detail the sources of e-waste in India, its quantification, the development and effect of informal recycle sector. The report also critically analysed existing environmental laws in India and tried to put forward recommendations considering experiences of India and certain developed countries [10]. E-Waste (Management & Handling) Rules (2011) were notified by the Ministry of Environment and Forests and have been applied to every producer, purchaser, collection centers, dismantler and recycler of e-waste. The regulatory agencies involved are State Pollution Control Boards (SPCBs)/Pollution Control Committees (PCCs) and CPCB.

These rules restrict the use of toxic materials while laying down specific rules for handling of items such as CRT, compressors etc [4]. Sushant B. Wath, Atul N. Vaidya, P.S. Dutt, Tapan Chakrabarti (2010), conducted a survey and appraisal of the E-waste administration arrangement of created and additionally creating nations with a unique accentuation on Switzerland, which is the main nation on the planet to have set up and executed a formal E-waste administration framework. Also, in view of the discourses of different methodologies, laws, enactments, practices of various nations, a guide for the advancement of feasible and viable E-waste administration framework in India for guaranteeing environment, and, word related security and wellbeing, is proposed [5]. M. N. Mundada, Sunil Kumar & A. V. Shekdar [1] condensed the different hotspots for e-waste. Natural and human health related perils connected with e-waste preparing by considering unsafe material and their structure, strategies for taking care of and handling. The common stream of waste administration frameworks is examined to build up a suitable methodology for advancement.

III. Research Methodology

Research Design: Descriptive research design was used for this study. The awareness and attitudes of consumers and retailers towards the problem of e-waste management and the rules regarding it was to be studied so descriptive design was most suitable for research. A survey of consumers and retailers was conducted to answer various questions which were later interpreted using various statistical methods which gave the required results.

Data Collection: The required data for the study is taken from primary as well as secondary data. The primary data was collected using separate questionnaires for consumers and retailers. It was filled by individuals and responses were collected. The secondary data is collected from various research papers that were studied in regard with the topic. There were 153 respondents that filled the questionnaire including both the consumers and the retailers.

Sampling Technique: Convenience and Judgemental sampling techniques are used to collect the data. Consumer data was collected from Students of UIAMS, Panjab University, while retailer data was collected from Sector 35 and Sector 22 markets of Chandigarh. Those people who were easy to reach were selected for collection of data.

In the collected data, 89.4% data was of people aged between 18-25 years, whereas 8.7% people were aged between 26-40 years. People below 18 years accounted for a mere 1.9%. The number of males (51.9%) who filled the questionnaire was slightly more than the number of females, who accounted for 48.1% of the sample population. The levels of education range from high school to graduate to post-graduate. Highest frequency is of post-graduate consumers who account for 79.8% of the respondents, followed by 11.5% graduates and 8.7% high school level educated consumers. The alpha coefficient for the retailer questionnaire is 0.895, suggesting that the items have relatively high internal consistency.

The alpha coefficient for the consumer questionnaire is 0.802, suggesting that the items have relatively high internal consistency.

Objectives

1. To study the relationship between e-waste awareness and disposal attitude.
2. To study the relationship between retailer e-waste awareness and recycling.

H₀₁ There Exist no Relationship Between Awareness of e-Waste Laws and Use of Proper Disposal Methods

Table 1 shows the output with Correlation between e-waste laws awareness & use of proper disposal methods. Underneath each correlation coefficient both the significance and the sample size (N) on which it is based is displayed. Each variable is perfectly correlated to itself so $r=1$ along the diagonal of the tables. The significance value $0.00 < 0.05$ tells that the probability of this correlation being false is very low. Pearson coefficient is positive indicating that increase in awareness of e-waste laws increases the use of proper disposal methods. *Hence, the null hypothesis is false and there exist a relationship between awareness of e-waste laws and use of proper disposal methods.*

Table 1 Analysis of relation between e-waste laws awareness & use of proper disposal methods

Correlations

		Are you aware of any laws regarding E-waste in India?	Would you be willing to return the goods to manufacturer s for free if they were properly disposed?
Are you aware of any laws regarding E-waste in India?	Pearson Correlation	1	.458**
	Sig. (2-tailed)		.000
	N	104	104
Would you be willing to return the goods to manufacturers for free if they were properly disposed?	Pearson Correlation	.458**	1
	Sig. (2-tailed)	.000	
	N	104	104

** . Correlation is significant at the 0.01 level (2-tailed).

H₀₂ There exist no relationship between retailer e-waste hazards awareness and recycling

Table 2 Analysis of relation between retailer e-waste hazards awareness and recycling

Correlations

		Are you aware of the health hazards related to E-waste?	Do you have procedures to recycle any components of electronic devices?
Are you aware of the health hazards related to E-waste?	Pearson Correlation	1	.640**
	Sig. (2-tailed)		.000
	N	49	49
Do you have procedures to recycle any components of electronic devices?	Pearson Correlation	.640**	1
	Sig. (2-tailed)	.000	
	N	49	49

** . Correlation is significant at the 0.01 level (2-tailed).

Table 2 shows the output with Correlation between e-waste hazards awareness of retailers and recycling. Underneath each correlation coefficient both the significance and the sample size (N) on which it is based is displayed. Each variable is perfectly correlated to itself so $r=1$ along the diagonal of the tables. The significance value $0.00 < 0.05$ tells that the probability of this correlation being false is very low. Pearson coefficient is positive indicating that an increase in awareness of e-waste hazards increases recycling by retailers. Hence, the null hypothesis is false and there exists a relationship between retailer e-waste hazards awareness and recycling.

IV. Conclusions & Future Work

The analysis concluded that an increase in awareness leads to both consumers as well as the retailers showing a positive attitude towards adoption of better, environmentally sound e-waste disposal procedures. Consumers that are aware of e-waste issues have a positive attitude towards paying an additional nominal fee, if proper management and disposal is ensured. Retailers who are aware of e-waste problems and the 2011, Guidelines are more responsible in their recycling procedures. Except for multinational corporations, very few local retailers have shown an interest to involve themselves in any events related to e-waste awareness that have happened in the past. Lastly, both consumers and retailers feel that it is the lack of awareness about the hazards of e-waste and problems in their disposal, which is the major factor hampering efficient e-waste management in India. For the future studies, more data can be collected with varied age group above 40 years and government initiatives must be taken into consideration.

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