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AN ANALYSIS ON CONSUMER AWARENESS, ATTITUDES AND BEHAVIOUR TOWARDS ELECTRONIC WASTE: A CASE STUDY OF VISAKHAPATNAM

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An Analysis on Consumer Awareness, Attitudes and Behaviour towards Electronic Waste: A Case Study of Visakhapatnam

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Abstract – The electronics industry is one of fastest growing manufacturing industries in India. However, the increase in the sales of electronic goods and their rapid obsolescence has resulted in the large-scale generation of electronic waste, popularly known as e-waste. E-waste has become a matter of concern due to the presence of toxic and hazardous substances present in electronic goods which, if not properly managed, can have adverse effects on the environment and human health. In India, the e-waste market remains largely unorganized, with companies being neither registered nor authorized and typically operating on an informal basis. In many instances, e-waste is treated as municipal waste, because India does not have dedicated legislation for the management of e-waste. It is therefore necessary to review the public health risks and strategies in a bid to addressthis growing hazard. There is the strong need for adopting sustainability practices in order to tackle the growing threat of e-waste. In the present work, we attempt to identify the various sources and reasons for e-waste generation, in addition to understanding the perception of the public towards e-waste management. This study aims to induce an awareness of sustainability practices and sustainability issues in the management of E-waste, especially waste related to personal computers (PCs) and mobile phones. From the results of the study, we concluded that the majority (90%) of the public is ignorant about e-waste and its issues; hence, there is a strong requirement for spreading awareness about the growing hazard of E-waste.

Humans are fast paced creatures always wanting and needing what they desire as quickly and efficiently as possible. This attitude that our society possesses has created the desire for the human race to always have the latest technologies irrespective of its consequences on the environment. Over the past two decades, the global market of electrical and electronic equipment (EEE) continues to grow exponentially, while the lifespan of those products becomes shorter and shorter. Therefore, business and waste management officials are facing a new challenge, and e-Waste or waste electrical and electronic equipment (WEEE) is receiving considerable amount of attention from policy makers.

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INTRODUCTION

The shifting way of life of people and escalating urbanization has lead to increasing rates of use of electronic gadgets. They have huge impact on every aspect of our daily life. These electronic gadgets have been extensively used by private organizations, households, government offices, and public private sectors, medical and educational institutes. The enhancement in the usage of electronic equipments particularly computers and cell phones has contributed substantial increase in large quantities of waste of electrical and electronic equipments (EEE) commonly known as ewaste.

With the onset of 21st century e-waste uprising, looms a disaster that is sure to spoil the quality of our lives and that of generation to come. Electronic waste, commonly known as 'e-waste' can be defined as

electronic gadgets/ products connects with power plug, batteries which have become obsolete due to: improvement in technology , changes in fashion, style and status , nearing the end of their useful life. According to OECD (2001) E- waste has been defined as "any appliance using an electronic power supply that has reached its end of life".

The electronic industry is the world's largest and fastest growing manufacturing industry. During the last decade, it has assumed that role of providing a forceful leverage of the socio-economic and technological growth of a developing society. The consequence of its consumer oriented growth combined with rapid product obsolescence and technological advances are a new environmental challenge - the growing menace of "Electronics Waste" or "E- Waste" that consists of obsolete electronic devices. It is an emerging problem as well

as a business opportunity of increasing significance, given the volumes of e-waste being generated and the content of both toxic and valuable materials in them.

The fraction including iron, copper, aluminium, gold and other metals in e-waste is over 60%, while plastic account for about 30% and the hazardous pollutants comprise only about 2.70%. Solid waste management, which is already a mammoth task in India, is becoming more complicated by the invasion of e-waste, particularly computer waste.

E-waste from developed countries find an easy way into developing countries in the name of free trade is further complicating the problems associated with waste management. As a popular and informal term, electronic waste (e-Waste) is loosely referred to any white goods, consumer and business electronics, and information technology hardware that is in the end of its useful life. Specifically, Puckett defines e-waste as "a broad and growing range of electronic devices ranging from large household devices such as refrigerators, air conditions, cell phones, personal stereos, and consumer electronics to computers which have been discarded by their users".

The manufacturing of electrical and electronic equipment (EEE) is one of the emerging global activities. The main factors identified to be responsible for the increased consumption and productions of electrical and electronic equipment are rapid economic growth, coupled with urbanization and industrialization. The Indian Information Technology (IT) sector is one of the major contributors to the global economy. At the same time, it is responsible for the generation of the bulk of E-waste or Waste Electrical and Electronic Equipment (WEEE) in India. Although the global E-waste problem has been able to attract attention across the world, not much emphasis has been given to the E-waste engendered in developing countries.

Developing countries like India, today, is burdened with the colossal problem of E-waste which is either locally generated or internationally imported, causing serious menace to human health and environment. The hazardous components in electrical and electronic equipment are a major concern during the waste management phase. In the context of India, recycling of Waste Electrical and Electronic Equipment is not undertaken to an adequate degree.

However, one of the major issues related to E-waste is that there is no standard definition of WEEE/E-waste. A number of countries have come out with their own definitions, interpretation and usage of the term "E-waste/WEEE". The most widely accepted definition and description of WEEE/ E-waste is as per the European Union directive. The Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE) covers all electrical and electronic equipment used by consumers.

E-WASTE- AN INDIAN SCENARIO

According to one estimate by the year 2012 the total outdated computers deriving from government infrastructure, corporate houses, industries and household is of the order of 2 million nos. producers and assemblers in a single year, estimated to create around 1200 tons of electronic scrap. It should be noted that obsolesce rate of personal computers (PC) is one in every two years. According to report predicted by (Basel convention in Bali Indonesia) the e-waste from computers will be increased by 500% in 2020, which may be 18 times higher from cell phones and triples from discarded refrigerators. The consumers find it comfortable to buy a new computer rather than upgrade the old one due to the changing configuration, technology and the attractive offers of the producers. Due to the lack of governmental legislations on e-waste, standards for disposal, proper mechanism for handling these toxic hi-tech products, mostly end up in landfills or partly recycled in a unhygienic conditions and partly thrown into waste streams.

Computer waste is generated from the individual households; the government, public and private sectors; computer retailers; manufacturers; foreign embassies; secondary markets of old PCs. Of these, the biggest source of PC scrap is foreign countries that export huge computer waste in the form of reusable components. Electronic waste or e-waste is one of the rapidly growing environmental problems of the world. In India, the electronic waste management assumes greater importance not only due to the generation of our own waste but also dumping of e-waste particularly computer waste from the developed countries. With extensively using computers and electronic equipments and people dumping old electronic goods for new ones, the amount of e-waste generation has been steadily increasing.

India being a developing nation requires simpler, cheap technology in view of maximum resource revival in environmental friendly methodologies. E-Parisaraa, deals with practical feature of e-waste processing as mentioned below by hand. Phosphor affects the display resolution and luminance of the images that is seen in the monitor. E-Parisaraa's Director Mr. P. Parthasarathy, an IIT Chennai graduate, and a former consultant for a similar e-waste recycling unit in Singapore, has developed an eco-friendly methodology for reusing, recycling and recovery of metals, glass & plastics with no incineration

methods. The dangerous materials are set aside separately and send for secure land fill for example phosphor coating, LED's, mercury etc. We have the knowledge to reprocess most of the e-waste and

only less than one percent of this will be regarded as waste, which can go into safe and sound landfill planned in the locality by the HAWA project.

DISPOSAL BEHAVIOUR AND CONSUMER AWARENESS

The development of science and technology stimulates the production of electrical and electronic equipment (EEE), and continuous product updates and short lifespan are driving forces for the large amounts of waste EEE (WEEE). Waste EEE is popularly known as electronic waste or E-waste. more precisely, when electrical and electronic products reach the end of their useful life, they become waste electrical and electronic equipment (WEEE), which is often referred to as Electronic waste or E-waste . It is one of the fastest growing global toxic waste streams today. There are a number of reasons for the unabated growth of the E-waste stream in the recent past. Firstly, production and use of electrical and electronic equipment (EEE) have significantly increased during the last three decades due to technological innovations and new applications of EEE. Fast technological progress and EEE becoming a part of everyday life have also led to the rapid growth of Waste Electrical and Electronic Equipment (WEEE). New electronic gadgets and appliances have infiltrated every aspect of our daily lives, providing our society with more comfort, health and security and with easy information acquisition and exchange. Secondly, there is a shift towards consumer society where people are engaged in discarding their products before the products could complete their full life spans. A large quantity of waste electrical and electronic equipment (WEEE) is being generated because technical innovation promotes the unceasing renewal of products. Thus, the growth of E-waste has been exponential globally posing serious threats to the human health and the environment.

Developing countries such as India and China are now facing the twofold stresses due to the domestic generation and illegal import of E-waste. However, managing this increasing volume of E-waste has been a major challenge. E-waste constitutes one of the most complicated solid waste streams, in terms of its composition, and, as a result, it is difficult to be effectively managed. With infrastructure, public awareness, finance and many other constraints, dealing with the problem of E-waste effectively, both in terms of environmental and socio-economic implications, has been a major cause of concern for the country of India. India has generated about 0.2 million tons of E-waste in 2006, about 0.4 million tons in 2010 and presently the quantum is increasing rapidly. Thus, urgent need arises to devise measures to address this ever increasing quantum of E-waste at the soonest possible.

MAJOR ISSUES AND POLICIES RELATED TO E-WASTE IN INDIA

While considering the problems related to E-waste in India, there are five major components which should be focused upon. These are Main Sources of E-waste in India, Magnitude of the Problem with respect to the Indian scenario, Health and Environmental Implications of Ewaste, Current Management practices of E-waste in India and Policy level initiatives in the country. The involvement of various sectors could be observed as the sources of generation of Ewaste.

The general flow of E-waste across different sectors are tried to represent by the following flow chart.
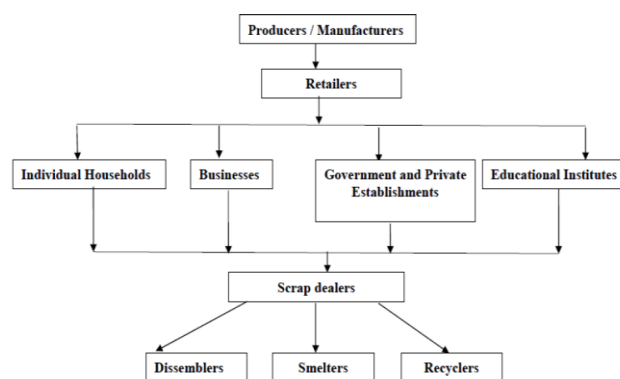
Magnitude of the Problem : In Indian context, the electronics industry has emerged as the fastest growing segment of Indian industry both in terms of production and exports. The Information Technology Revolution of the early 1990s intensified the problem of E-waste in India. Sixty-five cities in India generate more than 60% of the total E-waste generated in India. Ten states generate 70% of the total E-waste generated in India. Maharashtra ranks first followed by Tamil Nadu, Andhra Pradesh, Uttar Pradesh, West Bengal, Delhi, Karnataka, Gujarat, Madhya Pradesh and Punjab in the list of E-waste generating states in India. Among the top ten cities generating E-waste, Mumbai ranks first followed by Delhi, Bangalore, Chennai, Kolkata, Ahmedabad, Hyderabad, Pune, Surat and Nagpur (Guidelines for Environmentally Sound Management of E-waste, 2008).

The recycling of E-waste is a major concern in India. The workers in the recycling sector are dominated by the urban poor with very low literacy levels and hence they have very little awareness regarding the potential hazards of E-waste. Among the urban poor, there are a substantial number of women and children engaged in various recycling activities which further exaggerate the problem of E-

waste as they are more vulnerable to the hazards from this kind of waste.

One of the major concerns related to E-waste, particularly in developing countries like India and China, are dumping of E-waste from some developed countries. Large quantities of used electronics are typically sold to countries like India, China and other countries in the Asia Pacific region. These electronics have very high repair capability and high raw material demand. This can result in high accumulations of residue in poor areas without strong environmental laws. Major reasons for these exports are cheap labour and lack of environmental and occupational standards in Asia. In this way the toxic effluent of the developed nations would flood towards the world's poorest nations.

Health and Environmental Implications - Electronic and Electrical Equipment are composed of an enormous amount of components. Many of them fall under the hazardous category. Majority of these components contain toxic substances that have adverse impacts on human health and the environment if not handled properly. Often, these hazards arise due to the improper recycling and disposal processes that are in practice in most of the developing countries including India. Such offensive practices can have serious aftermath for those staying in proximity to the places where E-waste is recycled or burnt.

Disposal of E-wastes is an unembellished problem faced by many regions across the globe. Electronic wastes that are landfilled produces contaminated leachates which eventually pollute the groundwater. Acids and sludge obtained from melting computer chips, if disposed on the ground causes acidification of soil. For example, Guiyu, Hong Kong a flourishing area of illegal E-waste recycling, is facing acute water shortages due to the contamination of water resources. This is due to disposal of recycling wastes such as acids, sludges etc. in rivers.

Mercury leaches when certain electronic devices, such as circuit breakers are destroyed. The same is true for polychlorinated biphenyls (PCBs) from condensers. When brominated flame retardant plastic or cadmium containing plastics are landfilled, both polybrominated diphenyl ethers (PBDE) and cadmium may leach into the soil and groundwater. It has been found that significant amounts of lead ion are dissolved from broken lead containing glass, such as the cone glass of cathode ray tubes, gets mixed with acid waters and are a common occurrence in landfills.

Policy level initiatives-

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.

The Hazardous Wastes (Management and Handling) Amendment Rules, 2003 - Under Schedule 3, E-waste is be defined as "Waste Electrical and Electronic Equipment including all components, sub-assemblies 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.

Guidelines for Environmentally Sound Management of E-waste, 2008 - This guideline 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 emphasises on the management and treatment practices of E-waste. The guideline incorporated concepts such as "Extended Producer Responsibility".

The e-waste (Management and Handling) Rules, 2011 - This is the very recent initiative and the only attempt in India meant solely for addressing the issues related to E-waste. These rules are not implemented in India as yet and will only come into practice from 1st May, 2012. According to this regulation, 'electrical and electronic equipment' means equipment which is dependent on electric currents or electro-magnetic fields to be fully functional and 'e-waste' means waste electrical and electronic equipment, whole or in part or rejects from their manufacturing and repair process, which are intended to be discarded. These rules are meant to be applied to every producer, consumer or bulk consumer involved in manufacturing, sale purchase and processing of electrical and electronic equipment, collection centers, dismantlers and recyclers of e-waste. Responsibilities of producers, collection centers, consumers, dismantlers, recyclers etc. are defined and incorporated in these rules.

METHODOLOGY

Study area -

Visakhapatnam is the second fastest 'emerging city' in India. The city is plagued by a large variety of pollution types. There is air pollution, the groundwater is polluted and plastic abuse is rampant; more recently, e-waste has seen a significant increase, too. With over 70 software companies and numerous schools and corporate offices in the city, e-waste has the potential to be the next big form of pollution within the city in the coming years.

Study design-

The study aimed to obtain information about the knowledge, awareness and disposal methods of e-waste as practiced by the urban population of Visakhapatnam. Each subject participated in a face-to-face interview. The questionnaire was designed to obtain information with respect to the above-mentioned parameters.

The structured interview and questionnaire-

During the face-to-face interview, questions consisted of five parts:

I)   Demographic profile: information included age, gender, marital status, occupation, income and education.

II)   Information regarding the use of electronic devices: to understand the various types of devices used, period of use, methods of storage, etc.

III)   Awareness regarding e-waste: to better understand the awareness of e-waste among the public.

IV)   E-waste disposal practices: included to evaluate individual perceptions and methods of e-waste disposal.

V)   Consumer behaviour: to comprehend the readiness of the consumer concerning various disposal options provided by the manufacturer.

Face-to-face interviews were thought to be more reliable for obtaining accurate information from respondents, as they hailed from a wide range of backgrounds and had different educational levels. This also helped to ensure that all questions were answered and that the answers were recorded in a consistent manner. Most of the questions utilized the checklist approach in order to reduce ambiguity and to facilitate quantitative analysis.

CONCLUSION

India being a developing nation needs some urgent approach to the e-waste management that includes policy level interventions, implementations and capacity building and to increase public awareness such that it can transform this challenge to a lucrative business also. Timely and stringent laws enforcement in this regard can save our nation from becoming a hub of e-waste.

Problems due to e-waste are likely to become serious in India in the near future. Whenever a customer replaces a computer or mobile phone, the replaced product may leave the customer, but it remains within the environment. There should therefore be regular improvements through research and development to enhance the reuse and recycling of products.

India is undoubtedly at present being dominated by the informal sector concerning the management of e-waste. However, the country has also started thinking about the sustainable management of e-waste. There exists an urgent need for the detailed assessment of the current and future scenarios, including quantification, characteristics, existing disposal practices and environmental impacts.

Moreover, there is a need for a framework that can help in the management of e-waste. A draft has been prepared for e-waste handling and the rules related there to, which is available on the website of the Ministry of Environment and Forests of India. The responsibilities of collection centres, producers, recyclers, dismantlers and consumers have been included in the draft.

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