RESEARCH PROJECT

On

"A STUDY ON E-WASTE DUMPING WITH SPECIAL REFERNCE TO MOBILE PHONES"

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PREFACE

"It is well said that self-knowledge is best through action and not through contemplation"

The basic ideology behind research project is to bring actual environment in touch of a B.B.M student. It is widely accepted that theory widen one's thinking & help in innovative thinking but practice indicates the possibilities of the idea & how far the theory can be applied successfully.

Under the research project, we have done the survey to know the awareness of people regarding the concept of E-waste dumping with special reference to mobile phones and to find out the proportion of E-waste dumping done in the environment just by mobile phones.

In the end, we would like to thank all those who have directly or indirectly contributed in completing the research project report. We hope that by this report will be beneficial for the customers & would help them to understand the growth of Indian economy if the switch to Indian brands

Acknowledgement

No great Endeavour in any field is possible in solitude. It needs inspiration, guidance and assistance at each and every step thus we preface our report by expressing sincere and deep gratitude to those who made it possible for us to complete our project work

We have no words to thank and appreciate to the people who gave us all the required information and made this report possible by imparting us with a lot of vital information.

We would like to express my sincere gratitude towards **Ms. SHALINI NIGAM, for** assigning us this project. We also like to thank her for imparting us knowledge from her enriched experiences and assisting us to learn from it.

INTRODUCTION

Electronic waste describes discarded electrical or electronic devices. The used electronics which are destined for reuse, resale, salvage, recycling or disposal are also considered as e-waste. Informal processing of electronic waste in developing countries may cause serious health and pollution problems, though these countries are also most likely to reuse and repair electronics.

At present, E-waste is mainly generated in countries of the Organization for Economic Cooperation and Development (OECD), which have highly saturated markets for electrical and electronic equipment (EEE) Although, the market penetration of EEE in industrializing countries is not very high, these countries show the fastest growing consumption rates for EEE, and thus large quantities of domestically generated.

E-waste would become part of the waste stream in the near future (ibid). Moreover, the global E-waste production keeps on changing due to the economic growth and the available technologies. Almost all the countries in the world, today, depend immensely on Information and Communication Technology (ICT) and other EEEs for their growth and development. As a result, new EEEs are introduced frequently in the global market. It implies that the amount of E-waste being produced will definitely increase in the near future. With new innovative technologies, the nature and mass of E-waste produced may change. As correctly put up by Robinson (2009), changes in technology will affect the global mass of E- waste produced. For example, the mass of a laptop is much lesser than the mass of a desktop computer. Specific changes in the technology and the consumption habits will decrease the mass of global E-waste production, since consumers will turn to less weighed EEEs. For example, consumers will turn more to portable PC solutions having 1 to 3 kg average weight as compared to the stationary computer weighing 25 kg. India is one of the fastest growing economies of the world. Although, the penetration of India's market for consumer durables is substantially lower than that of developed countries, the size of India's market in absolute terms is larger than that of many high-income countries Emerging economies such as China and India are large generators of WEEE and have the fastest growing markets for electrical and electronic equipment The useful life of consumer electronic products is relatively short, and decreasing as a result of
rapid changes in equipment features and capabilities. The country of India, today, is burdened with the colossal problem of E-waste which is either internally generated or illegally imported, causing serious problems to human health and environment.

Since 1990, the first phase of economic liberalisation, the problems associated with E-waste in India have started manifesting. The Indian information technology (IT) industry has been one of the major drivers of change in the economy in the last decades and has contributed significantly to the "digital revolution" being experienced by the world. At the same time, it is responsible for the generation of the bulk of E-waste in the country. The rapid uptake of information technology around the world coupled with the availability of new design and technology in the electronic sector is causing the early obsolescence of many electronic items used around the world today. Till 2006, the world's production of E-waste was estimated at 20 to 50 million tonnes per year, representing 1 to 3% of the global municipal waste production of 1636 million tonnes per year. In the year 2008, Ladou and Lovegrove estimated that one billion computers will stop working in the next five years. Short innovation cycles of hardware have led to a high turnover of devices. The lifespan of central processing units in computers dropped from 4 to 6 years in 1997 to 2 years in 2005 Thus, with the decrease in the average lifespan of EEEs, planet Earth will certainly have to take the load of more and more volume of E-waste in the coming years.

Amount of E-waste generated by Mobile Phones

With the great global surge of mobile gadget use has come a tsunami of cell phone garbage, the United Nations warned on Monday—especially in India and China. And that's on top of tidal waves of computer, video receiver, and kitchen electronics junk skewing about the planet in all the wrong places. All in all, global e-waste is growing by 40 million tons a year, a study by the UN's Environmental Programme concludes.

The UNEP will soon meet in Bali, Indonesia to further consider the problem, and it is huge. Consumers bought almost 900 million mobile phones in 2006 and over a billion in 2007, UNEP estimates. A big percentage of those devices are just thrown in the trash, or given to local collectors who extract precious metals from them in environmentally hazardous ways. The study predicts that by 2020, the amount of e-waste from dumped mobiles in China will be about seven times larger than it was in 2007, and in India 18 times higher. At present, India alone produces about 1,700 tons of e-waste from mobiles, Columbia about 1,200 tons, and Kenya another 150 tons.

The United States is the big winner when it comes to e-waste: 3 million tons a year all told, followed by China's 2.3 million. But, "despite having banned e-waste imports, China remains a major e-waste dumping ground for developed countries," the report notes.

All that junk doesn't just come from mobiles. By 2020, e-waste in South Africa and China from old computers will have leapt to as much as 400 percent of its 2007 levels, and by 500 percent in India. In China and India, the piles of dumped TV sets will be 1.5 to two times taller, while the mountains of old refrigerators could reach three times their present altitude, the report warns.

And don't get the UN started about old printers, pagers, digital cameras, music players, and laptops. "This report gives new urgency to establishing ambitious, formal and regulated processes for collecting and managing e-waste via the setting up of large, efficient facilities in China," declared UNEP Executive Director Achim Steiner. Everywhere else too, he added. Much of the developing world faces "rising environmental damage and health problems if e-waste recycling is left to the vagaries of the informal sector."

Over the last decade, quality of life and owning electronics have become inextricably linked. As a result, the production and sale of electronic goods has skyrocketed worldwide. Due to rapid advances in technology, there is a much wider range of products available and new versions of existing goods are being launched constantly. Therefore, the rate at which electronics are being discarded (and sheer volume of waste) has increased drastically as well. This electronic waste, or e-waste, is being exported to developing countries where crude 'recycling' techniques expose both the workers and the environment to dangerous chemicals.

Human Health and Environmental Issues

It is an undeniable fact that e-waste in "backyard" recycling operations poses a major threat to both human health and the environment. Valuable metals such as gold and copper can be extracted from electronics, but this recovery process is often done in the cheapest and most unsafe way.

Plastics, which contain heavy metals and flame retardants, are burned in open piles and release deadly dioxin and furans. Cathode ray tubes (CRTs) are broken with hammers to remove copper, a process that also releases toxic phosphor dust. Circuit boards are literally cooked over open flames or in shallow pans, exposing workers to lead fumes. Acid baths are used to extract gold from circuit board chips, spewing even more toxic gases into the air. These processes release a wide variety of heavy metals including lead, cadmium, and mercury into the air, soil, and water

Despite the obviously toxic nature of the most common 'recycling' techniques, over 90% of e-waste landfills or dumps have no environmental standards unbelievably; Nigeria does not have a single legally licensed landfill despite having a population of 115 million and being a popular e-waste dumping ground.

The environmental impacts of unregulated 'recycling' sites are evident in polluted groundwater, extremely unsafe levels of lead and mercury in nearby rivers, and toxic emissions that contribute to global warming.

Workers at e-waste sites are usually migrants from extremely poor areas and are often children. They have little to no access to gloves or face masks and are often too desperate for work or uniformed to care about the health risks. Workers at e-waste sites are prone to skin rashes, cancer, weakening of the immune system, and respiratory, nerve, kidney, and brain damage. In China's Guiyu region, workers have extremely high levels of toxic fire retardants in their bodies and over 80% of the children already have lead poisoning.

Objectives of Study

1. To find out of amount of E – waste dumping done by households

2. To know the amount of E – waste done by shopkeepers and resellers in Agra.

Literature Review

Smart phones and mobile phones have made the world a smaller place and added comfort to our lives and since the advent of mobile phones, the sales chart of mobile phones has always pointed upward. According to a report by **Gartner**, 1.74 billion cell phones were sold in 2012, and 1.80 billion in 2013. The study expects 1.89 billion mobile phones to be sold in 2014 and 1.96 billion in 2015.

However, with all of us buying a new phone or upgrading to a new one, we also need to give some thought to what will happen to pre-existing mobile phones. As per, Server data in 2010, on an average, the US disposed of more than 400,000 mobile phones on daily basis. Since then this number has been increasing continuously. These discarded mobile phones either reach the landfill or more often than end up being processed by improper recycling setups. In case, it reaches the landfill, harmful chemicals from mobile phone e-waste may leak into the soil, contaminate the ground water and enter the food chain causing hazards to the environment and living beings. And when these old mobile phones end up in the hands of improper recyclers, the crude methods they use like leaching and open air incineration for extracting trace metals, releases toxic chemicals in environment, harming the eco-system. Let's take a deeper look.

Toxic Chemicals in Mobile Phones

Mobile handsets contain numerous chemicals and elements that can be hazardous, if not treated properly while disposal. In 2012, Ann Arbor-based ecology center and technical experts at iFixit conducted a research on 36 different cell-phones to test their toxicity. These included handsets from the following companies:

- **Apple**
- **Hewlett-Packard Development Company**
- **L.P**
- **HTC Corporation**
- **Huawei Technologies Co. Ltd**
- **LG Electronics**
- **Motorola Inc.**
- **Nokia Corporation**
- **Palm Inc.**
- **Research in Motion (RIM)**
- **Samsung Electronics**

At least one of the following five hazardous chemicals was found in all of these mobile handsets:

1. Lead
2. Bromine
3. Chlorine
4. Mercury
5. Cadmium

Hazards of Mishandling Mobile Phone E-waste:

Let's look at how these chemicals may be released into the environment and how they can be hazardous for the planet if not disposed in the right manner:

1. **Lead**: Lead is released when cell phones are heated during processes like open air incineration for extraction of trace metals from printed circuit boards (PCBs). When PCBs in mobile phones are incinerated most of the lead transforms into slag. If this slag is not treated properly, it ends up polluting the air in the form of fumes or dust, causing environmental and health hazards.
When released in the environment, lead alters the natural functions of air and water. On continuous exposure, lead can disrupt the functioning of central and peripheral nervous system, blood system, reproductive system and kidneys. It may also prevent proper brain development in children.

2. **Bromine** – It is present in mobile phones, primarily as flame retardants for fire safety requirements. Polybrominated biphenyls and polybrominated diphenyl ethers are two types of brominated flame retardants which are considered extremely hazardous for the environment and human health. In many countries, these two brominated flame retardants have been replaced by TBBP-A (tetrabromobisphenol). This chemical is known to be comparatively less hazardous.
Brominated flame retardants can disturb the functioning of the endocrine (hormonal) system. It may cause genotoxic damage by affecting the levels of thyroid stimulating hormones, which increases the risk of cancer.

3. **Chlorine** – It is present in the form of PVC (polyvinyl chloride) in the plastic component of cell phone. If proper care is not taken while disposing or recycling a

cell phone, there is a huge risk of dioxin formation during the burning of plastic in e-waste.
Substantial exposure to these dioxins may cause reproductive failure and suppress the immune system.

4. **Mercury** – If e-waste gets dumped in the landfill then it leaches from cell-phones into soil and then pollutes the food chain of the region. It is primarily present in the batteries.
Mercury is considered to be toxic for the central and peripheral nervous system. If inhaled as vapor, it can be hazardous for the digestive system, the immune system and the nervous system, causing damage to lungs and kidneys. Inhalation and ingestion may lead to corrosion of skin and eyes. If proper precautions are not taken, exposure to mercury can be fatal.

5. **Cadmium** – Heating or burning electronic equipment releases Cadmium in the air. When ignorant or unethical recyclers burn plastics, heat metals and shred PCBs, Cadmium and Cadmium oxides are released in the form of dust and fumes. A single Cadmium smartphone battery has the capacity to pollute 60,000 litres of water. If this contaminated water is consumed by humans, overtime it can accumulate in the kidney and liver and may cause toxic effect on kidney, skeletal system and respiratory system. It is also known as one of the human carcinogens.
Although, one cannot completely get away from the comfort of using a cell-phone but we can still make sure that our e-waste ends up in proper recycling facilities. In order to be sure that our mobile phones or other obsolete electronic equipment is handled by the right recycler, read – responsible e-waste recycling. This will help in the reduction of environmental and health hazards occurring due to the increasing piles of e-waste.

Some Statistics:

- For every 1 million cell phones that are recycled, 35,274 lbs of copper, 772 lbs of silver, 75 lbs of gold, and 33 lbs of palladium can be recovered
- Cell phones and other electronic items contain high amounts of precious metals like gold or silver. Americans dump phones containing over $60 million in gold/silver every year.
- Australians upgrade or exchange their mobile phones every 18 months, meaning there are approximately 16 million unused mobile phones stashed away at home or in the office (Source: AMTA)

- Average working life of a mobile phone is 7 years but worldwide the average consumer changes their mobile every 11 months
- Australians purchased 40 million mobile phones in past 5 years including 9.28 million in 2007 (Source: AMTA)
- Over 90% of materials in mobile phones can be recovered such as nickel, cadmium, cobalt, gold, silver, copper, plastics and other metals (Source: AMTA)
- Over one billion mobile phone handsets were currently in use around the world in 2006 (Canning, 2006)
- In 2006, it was estimated that each year 130 million mobile phones in the US and 105 million mobile phones in Europe will be thrown away (Canning, 2006)
- 700 million obsolete phones discarded in 2005 contained an estimated 560,000 kg of lead in the form of solder

"A ton of used mobile phones, for example – or approximately 6,000 handsets (a tiny fraction of today's 1 billion annual production) -- contains about 3.5 kilograms of silver, 340 grams of gold, 140 grams of palladium, and 130 kg of copper, according to StEP. The average mobile phone battery contains another 3.5 grams of copper. Combined value: over US $15,000 at today's prices."

A new study by the Massachusetts Institute of Technology suggests that the US discarded 258.2m computers, monitors, TVs and mobile phones in 2010, of which only 66% was recycled. Nearly 120m mobile phones were collected, most of which were shipped to Hong Kong, Latin America and the Caribbean. The shelf life of a mobile phone is now less than two years, but the EU, US and Japanese governments say many hundreds of millions are thrown away each year or are left in drawers. In the US, only 12m mobile phones were collected for recycling in 2011 even though 120m were bought. Meanwhile, newer phone models are racing on to the market leaving old ones likely to end up in landfills. Most phones contain precious metals. The circuit board can contain copper, gold, zinc, beryllium, and tantalum, the coatings are typically made of lead and phone makers are now increasingly using lithium batteries. Yet fewer than 10% of mobile phones are dismantled and reused. Part of the problem is that computers, phones and other devices are becoming increasingly complex and made of smaller and smaller components.

Research Methodology

We have used probability sampling methods like simple random sampling. This is because we have visited and conducted this study in households through online questionnaires..

Simple random sampling

Each individual will be chosen randomly and entirely by chance, such that each individual has the same probability of being chosen at any stage during the sampling process.

Stratified Sampling:

Stratified Sampling would be done solely for the common people. They will be divided into different strata of society in order to get an idea on how each of these strata behaves when they plan to buy goods.

Cluster sampling

In this technique, the total population will be divided into these groups (or clusters) and a simple random sample of the groups will be selected. Then the required information will be collected from a simple random sample of the elements within each selected group. This may be done for every element in these groups or a subsample of elements may be selected within each of these groups. A common motivation for cluster sampling is to reduce the total number of interviews and costs given the desired accuracy. Assuming a fixed sample size, the technique gives more accurate results when most of the variation in the population is within the groups, not between them.

Sample Size: 50 households

Methods of Primary Data collection:

- Personal Interview
- Questionnaire

The present study is an exploratory in nature. A different method of data collection was applied to complete the survey work. Data was collected on consumer preference, attitude and perception towards foreign and Indian brands and factors that they consider while purchasing the product through primary sources whereas visits were made to different libraries and government offices to collect information on various related issues from secondary sources. Regarding the product selection most commonly used products have been chosen as it was not possible to include the whole range of durable products. Only three products Refrigerator, Wrist Watch and Washing Machine have been selected. Primary data were collected through questionnaire containing different close ended questions. To obtain the information from respondents, a detailed questionnaire containing two sections was prepared.

FINDINGS AND ANALYSIS

We gave out two questionnaires – one for households and the other for shops. Just to give a brief idea about the questionnaire, here are some screenshots:

QUESTIONNAIRE FOR CONSUMERS:

E - waste Dumping with Special Reference to Mobile phones (For Consumers)

Dear Candidate,

This is a study on "E -waste Dumping with special reference to mobile phones" done by the students of BBM honors. We, Anshul Jurel, Arat Singh, Jayant Pratap Singh and Sohang Mathur are conducting this survey to find out the proportion of E- waste dumping done in the environment just by mobile phones. We value your inputs and we will see to it that your information is put to good use.

* Required

Name *

Phone Number

Do you have a Mobile phone? *

- (•) YES
- ( ) NO

How many mobile phones do you have?

- ( ) 1

- 2
- More than 2

For how long have you had your current phone?

- 1 year
- Less than a year
- More than 1 year
- More than 2 years
- Other:

Do you buy a new phone every time a new model gets launched?

- yes
- no
- Other:

Are you aware of the concept of E -waste Dumping?

- Yes
- No
- A little bit

What did you do with your old phone?

- Discarded it
- I still have it
- Sold it to a retailer/dealer
- I don't have an old phone
- Gave it to a friend/relative/acquantaince
- Other:

If you have discarded, have you discarded all your phones outside?

- NO
- no, some

- Yes, all of them
- yes, some
- Other:

Do you think it is ok to dump your phone in an outside area?

- yes
- no

Did you reuse or recycle your old/used phone?

- yes
- no

Will you tell people around you not to discard their phones outside?

- yes
- no

RECOMMENDATIONS AND SUGGESTIONS

What can be done to prevent the hazards?
The trans-boundary movement of e-waste including CRT is controlled by Basel Convention. Under this convention exporting CRT is illegal. According to the Director of Toxics Link, Ravi Agarwal, the Indian e-waste policy categorizes glass cullet from CRTs as hazardous. The director also added that while the existing policies do stress on approval regarding the importing and recycling of such products, the implementation of these policies was quite lopsided.

Speaking about a solution to this issue, he further added that the country needed well-defined, detailed and specific guidelines with regard to e-waste import, recycling and disposal. Implementation of these guidelines and policies is equally important, which require capacity development by all stakeholders involved.

The government has set up the E-waste (Management and Handling) Rules, which has well-defined Extended Producer Responsibility (EPR) policies. The EPR holds producers/manufacturers of electronic equipment responsible for managing the waste from their products. However, a large fraction of CRT waste may still fall

under the category of orphaned e-waste. The government needs to come up with a policy to address this category too.

Apart from that as consumers, we can also play a vital role in restricting the menace of rising mountains of e-waste. We should make use of our electronic equipment until it reaches its end-of-life stage. After end-of-life, it must be handed over to a certified, ethical and eco-friendly recycler for environmentally safe and responsible disposal. This will help us to limit the increasing amount of e-waste and also reduce the hazardous after-effects of improper disposal.

CONCLUSION

There are currently very few regulations on the disposal of E-Waste and they are being allowed to enter our landfills or be burned. We are willingly allowing hazardous substances to leach into our water and air so that we may enjoy a new form of technology. This problem is not going to go away because the global population is growing and the demand for newer and better technology is creating enormous amounts of old and outdated electronics.

There are better ways to dispose of this E-Waste which include:

- Buy second hand electronic devices, try to fix it before throwing it away, try to sell so that someone doesn't buy a new one.
- Implement Stricter laws and regulations to help facilitate a movement towards recycling and reusing
- Educate the population better so that they fully understand the potential consequences to improper disposal

- Many large corporations such as Best Buy or Verizon will take back old and unwanted electronic devices. Contact the large retailers before you throw away your mobile phones
- Donate to government supported programs
- Take advantage of your local community clean sweep
- Take it to a place to be properly recycled

REFERENCES

- http://en.wikipedia.org/wiki/electronic_waste/
- http://www.deccanchronicle.com/140812/nation-current-affairs/

ARTICLE/INDIAS-CAPITAL-BECOMING-WORLDS-E-WASTE-DUMPING-YARD-SAYS

- HTTP://ATTERO.IN/BLOGS/TAG/INDIA-A-DUMPING-GROUND/
- HTTP://ATTERO.IN/BLOGS/MOBILE-PHONE-E-WASTE-THE-HEALTH-AND-ENVIRONMENTAL-HAZARDS/