CHAPTER 01

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The electrical and electronic waste (e-waste) is one of the fastest growing waste streams in the world. The increasing "market penetration" in developing countries, "replacement market" in developed countries and "high obsolescencerate" make e-waste as one of the fastest growing waste streams. Environmental issues and trade associated with e-waste at local, transboundary and international level has driven many countries to introduce interventions. In accordance with the National Environmental Policy (NEP) and to address sustainable development concerns, there is a need to facilitate the recovery and/or reuse of useful materials from waste generated from a process and/or from the use of any material thereby, reducing the wastes destined for final disposal and to ensure the environmentally sound management of all materials. The NEP also encourages giving legal recognition and strengthening the informal sectors system for collection and recycling of various materials. In particular considering the high recyclable potential of e-waste such wastes should be subject to recycling in an environmentally sound manner. E-waste comprises of wastes generated from used electronic devices and house hold appliances which are not fit for their original intended use and are destined for recovery, recycling or disposal. Such wastes encompasses wide range of electrical and electronic devises such as computers, hand held cellular phones, personal stereos, including large household appliances such as refrigerators, air conditioners etc. E-wastes contain over 1000 different substances many of which are toxic and potentially hazardous to environment and human health, if these are not handled in an environmentally sound manner. The growth of e-waste has significant economic and social impacts. The increase of electrical and electronic products, consumption rates and higher obsolescence rate leads to higher generation of e-waste. The increasing obsolescence rate of electronic products also adds to the huge import of used electronics products. The e-waste inventory based on this obsolescence rate in India for the year 2005 has been estimated to be 1,46,180 tonnes which is expected to exceed 8,00,000 tonnes by 2012.

CHAPTER 02

INTRODUCTION

INTRODUCTION

Industrial revolution followed by the advances in information technology during the last century has radically changed people's lifestyle. Although this development has helped the human race, mismanagement has led to new problems of contamination and pollution. The technical prowess acquired during the last century has posed a new challenge in the management of wastes. For example, personal computers (PCs) contain certain components, which are highly toxic, such as chlorinated and brominated substances, toxic gases, toxic metals, biologically active materials, acids, plastics and plastic additives. The hazardous content of these materials pose an environmental and health threat. Thus proper management is necessary while disposing or recycling ewastes.

These days computer has become most common and widely used gadget in all kinds of activities ranging from schools, residences, offices to manufacturing industries. E-toxic components in computers could be summarized as circuit boards containing heavy metals like lead & cadmium; batteries containing cadmium; cathode ray tubes with lead oxide & barium; brominated flame-retardants used on printed circuit boards, cables and plastic casing; poly vinyl chloride (PVC) coated copper cables and plastic computer casings that release highly toxic dioxins & furans when burnt to recover valuable metals; mercury switches; mercury in flat screens; poly chlorinated biphenyl's (PCB's) present in older capacitors; transformers; etc. Basel Action Network (BAN) estimates that the 500 million computers in the world contain 2.87 billion kgs of plastics, 716.7 million kgs of lead and 286,700 kgs of mercury. The average 14-inch monitor uses a tube that contains an estimated 2.5 to 4 kgs of lead. The lead can seep into the ground water from landfills thereby contaminating it. If the tube is crushed and burned, it emits toxic fumes into the air.

OBJECTIVES OF THE STUDY:

1. Evaluate EU policy and legislation (Waste Framework Directive) options and opportunities related to waste management collection practices.

2. Contribute on mobilising ICTs to facilitate the transition to an energy-efficient, low-carbon economy waste management methodologies. The overall aim is to contribute with the EU objectives in relation to GHG reduction for 2020 in the waste management sector.

3. Develop appropriate environmental assessment, implementation and monitoring activities related to different waste collection methodologies and the respective benefits to improve current waste management practices.

- Improvement of people's quality of life
- Reduce environmental impact comparing with current methodologies
- Increase waste recycling level and citizens' cooperation
- Reduce investment and operational costs, noise and traffic problems

4. Demonstrate the optimization of waste management practices (Local Action Plans) through the implementation of the EWAS model at a local and sectoral level.

5. Increase the awareness of new waste collection methodologies, provide training and disseminate information for the active participation of local stakeholders.

CHAPTER 03

COMPANY PROFILE

An overview

Spanet security solutions

Name	**:Spanet security solutions**
Incorporation	**:** January, 2015
Commercial operatiions	**:** October , 2015
Slogan of company	**: "**solutions for you"
Type of company	**:** private limited company.
Main business	**:** dealer of EDC machines, GPS vehicle Tracking distributors ,Wireless Card Swipe Machine Dealers, Wireless Swipe Card Machine Distributors, Swipe Card Machine Wholesalers.
No of employees	**:** 27
Ownership	**:** private limited company
Years in business	**:** 4

Vision,Mission and Core values of Spanet Security Solutions

Vision

Our vision is to emerge a dynamic, techno_savvy, customer centric and reliable and good management company with its presence within the entire country, working in an environment of professionalism, trust and tranceparency, observing highest standards of service and corporate social responsibility, meeting the expectations of all its stake holders as well as aspirations of employees. Our aim is to bring simplicity to every project through experience and management, thus reducing the downtime and consequently.

Mission

This well-known establishment acts as a one-stop destination servicing customers both local and from other parts of Pune. Over the course of its journey, this business has established a firm foothold in it’s industry. The belief that customer satisfaction is as important as their products and services, have helped this establishment garner a vast base of customers, which continues to grow by the day. This business employs individuals that are dedicated towards their respective roles and put in a lot of effort to achieve the common vision and larger goals of the company. In the near future, this business aims to expand its line of products and services and cater to a larger client base. In Pune, this establishment occupies a prominent location in Ambegaon Budruk. It is an effortless task in commuting to this establishment as there are various modes of transport readily available. It is at , Nr Gai Mukh, which makes it easy for first-time visitors in locating this establishment.

Core values of Spanet Security Solutions

To enhance mission performance and achieve our shared goals, we are committed to promoting a culture founded on these core values:

Accuracy

We are committed to accurate, context-sensitive interpretation and application of agreements, standards, policies, and regulations.

Accountability

We honor our commitments and protect the confidentiality of information.

Availability

We are available to provide timely guidance and feedback, and we assure the right information is available to the right person(s) at the right time.

Integrity

We conduct ourselves in an honest, trustworthy and ethical manner at all times.

Respect

We respect and care for others.

Openness

We share ideas and information across organizational boundaries. We listen to our customers and collaborate with them to find the best possible solution.

CHAPTER 04

LITERATURE REVIEW

E WASTES MANAGEMENT

E-WASTES

Electronic waste, also called e-waste, various forms of electric and electronic equipment that have ceased to be of value to their users or no longer satisfy their original purpose. Electronic waste (e-waste) products have exhausted their utility value through either redundancy, replacement, or breakage and include both “white goods” such as refrigerators, washing machines, and microwaves and “brown goods” such as televisions, radios, computers, and cell phones. Given that the information and technology revolution has exponentially increased the use of new electronic equipment, it has also produced growing volumes of obsolete products; e-waste is one of the fastest-growing waste streams. Although e-waste contains complex combinations of highly toxic substances that pose a danger to health and the environment, many of the products also contain recoverable precious materials, making it a different kind of waste compared with traditional municipal waste.

Globally, e-waste constitutes more than 5 percent of all municipal solid waste and is increasing with the rise of sales of electronic products in developing countries. The majority of the world’s e-waste is recycled in developing countries, where informal and hazardous setups for the extraction and sale of metals are common. Recycling companies in developed countries face strict environmental regulatory regimes and an increasing cost of waste disposal and thus may find exportation to small traders in developing countries more profitable than recycling in their own countries. There is also significant illegal transboundary movement of e-waste in the form of donations and charity from rich industrialized nations to developing countries. E-waste profiteers can harvest substantial profits owing to lax environmental laws, corrupt officials, and poorly paid workers, and there is an urgent need to develop policies and strategies to dispose of and recycle e-waste safely in order to achieve a sustainable future.

EFFECTS ON ENVIRONMENT AND HUMAN HEALTH

Disposal of e-wastes is a particular problem faced in many regions across the globe. Computer 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 thriving 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. Now water is being transported from faraway towns to cater to the demands of the population. Incineration of e-wastes can emit toxic fumes and gases, thereby polluting the surrounding air. Improperly monitored landfills can cause environmental hazards. Mercury will leach 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 dlphenyl 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.

Not only does the leaching of mercury poses specific problems, the vaporization of metallic mercury and dimethylene mercury, both part of Waste Electrical and Electronic Equipment (WEEE) is also of concern. In addition, uncontrolled fires may arise at landfills and this could be a frequent occurrence in many countries. When exposed to fire, metals and other chemical substances, such as the extremely toxic dioxins and furans (TCDD tetrachloro dibenzo-dioxin, PCDDs-polychlorinated dibenzodioxins. PBDDs-polybrominated dibenzo-dioxin and PCDFs-poly chlorinated dibenzo furans) from halogenated flame retardant products and PCB containing

condensers can be emitted. The most dangerous form of burning e-waste is the open-air burning of plastics in order to recover copper and other metals. The toxic fall-out from open air burning affects both the local environment and broader global air currents, depositing highly toxic by products in many places throughout the world.

Table I summarizes the health effects of certain constituents in e-wastes. If these electronic items are discarded with other household garbage, the toxics pose a threat to both health and vital components of the ecosystem. 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. Also, in the late 1980s, a tightening of environmental regulations in industrialized countries led to a dramatic rise in the cost of hazardous waste disposal. Searching for cheaper ways to get rid of the wastes, "toxic traders" began shipping hazardous waste to developing countries. International outrage following these irresponsible activities led to the drafting and adoption of strategic plans and regulations at the Basel Convention. The Convention secretariat, in Geneva, Switzerland, facilitates and implementation of the Convention and related agreements. It also provides assistance and guidelines on legal and technical issues, gathers statistical data, and conducts training on the proper management of hazardous waste.

BASEL CONVENTION

The fundamental aims of the Basel Convention are the control and reduction of transboundary movements of hazardous and other wastes including the prevention and minimization of their generation, the environmentally sound management of such wastes and the active promotion of the transfer and use of technologies.

A Draft Strategic Plan has been proposed for the implementation of the Basel Convention. The Draft Strategic Plan takes into account existing regional plans, programmes or strategies, the decisions of the Conference of the Parties and its subsidiary bodies, ongoing project activities and process of international environmental governance and sustainable development. The Draft requires action at all levels of society: training, information, communication, methodological tools, capacity building with financial support, transfer of know-how, knowledge and sound, proven cleaner technologies and processes to assist in the concrete implementation of the Basel Declaration. It also calls for the effective involvement and coordination by all concerned stakeholders as essential for achieving the aims of the Basel Declaration within the approach of common but differentiated responsibility.

Table I: Effects of E-Waste constituent on health

Source of e-wastes	Constituent	Health effects
Solder in printed circuit boards, glass panels and gaskets in computer monitors	Lead (PB)	• Damage to central and peripheral nervous systems, blood systems and kidney damage. • Affects brain development of children.
Chip resistors and semiconductors	Cadmium (CD)	• Toxic irreversible effects on human health. • Accumulates in kidney and liver. • Causes neural damage. • Teratogenic.
Relays and switches, printed	Mercury (Hg)	• Chronic damage to the brain. • Respiratory and skin disorders due to bioaccumulation in fishes.

circuit boards		
Corrosion protection of untreated and galvanized steel plates, decorator or hardner for steel housings	Hexavalent chromium (Cr) VI	• Asthmatic bronchitis. • DNA damage.
Cabling and computer housing	Plastics including PVC	Burning produces dioxin. It causes • Reproductive and developmental problems; • Immune system damage; • Interfere with regulatory hormones
Plastic housing of electronic equipments and circuit boards.	Brominated flame retardants (BFR)	• Disrupts endocrine system functions
Front panel of CRTs	Barium (Ba)	Short term exposure causes: • Muscle weakness; • Damage to heart, liver and spleen.
Motherboard	Beryllium (Be)	• Carcinogenic (lung cancer) • Inhalation of fumes and dust. Causes chronic beryllium disease or beryllicosis. • Skin diseases such as warts.

A set of interrelated and mutually supportive strategies are proposed to support the concrete implementation of the activities is described below:

1. To involve experts in designing communication tools for creating awareness at the highest level to promote the aims of the Basel Declaration on environmentally sound management and the ratification and implementation of the Basel Convention, its amendments and protocol with the emphasis on the short-term activities.
2. To engage and stimulate a group of interested parties to assist the secretariat in exploring fund raising strategies including the preparation of projects and in making full use of expertise in non-governmental organizations and other institutions in joint projects.
3. To motivate selective partners among various stakeholders to bring added value to making progress in the short-term.
4. To disseminate and make information easily accessible through the internet and other electronic and printed materials on the transfer of know-how, in particular through Basel Convention Regional Centers (BCRCs).
5. To undertake periodic review of activities in relation to the agreed indicators;
6. To collaborate with existing institutions and programmes to promote better use of cleaner technology and its transfer, methodology, economic instruments or policy to facilitate or support capacity-building for the environmentally sound management of hazardous and other wastes.

The Basel Convention brought about a respite to the transboundary movement of hazardous waste. India and other countries have ratified the convention. However United States (US) is not a party to the ban and is responsible for disposing hazardous waste, such as, e-waste to Asian countries even today. Developed countries such as US should enforce stricter legislations in their own country for the prevention of this horrifying act.

In the European Union where the annual quantity of electronic waste is likely to double in the next 12 years, the European Parliament recently passed legislation that will require manufacturers to take back their electronic products when consumers discard them. This is called Extended Producer Responsibility. It also mandates a timetable for phasing out most toxic substances in electronic products.

MANAGEMENT OF E-WASTE

It is estimated that 75% of electronic items are stored due to uncertainty of how to manage it. These electronic junks lie unattended in houses, offices, warehouses etc. and normally mixed with household wastes, which are finally disposed off at landfills. This necessitates implementable management measures.

In industries management of e-waste should begin at the point of generation. This can be done by waste minimization techniques and by sustainable product design. Waste minimization in industries involves adopting:

- inventory management,
- production-process modification,
- volume reduction,
- recovery and reuse.

Inventory management

Proper control over the materials used in the manufacturing process is an important way to reduce waste generation (Freeman, 1989). By reducing both the quantity of hazardous materials used in the process and the amount of excess raw materials in stock, the quantity of waste generated can be reduced. This can be done in two ways i.e. establishing material-purchase review and control procedures and inventory tracking system.

Developing review procedures for all material purchased is the first step in establishing an inventory management program. Procedures should require that all materials be approved prior to purchase. In the approval process all production materials are evaluated to examine if they contain hazardous constituents and whether alternative non-hazardous materials are available.

Another inventory management procedure for waste reduction is to ensure that only the needed quantity of a material is ordered. This will require the establishment of a strict inventory tracking system. Purchase procedures must be implemented which ensure that materials are ordered only on an as-needed basis and that only the amount needed for a specific period of time is ordered.

Production-process modification

Changes can be made in the production process, which will reduce waste generation. This reduction can be accomplished by changing the materials used to make the product or by the more efficient use of input materials in the production process or both. Potential waste minimization techniques can be broken down into three categories:

i) Improved operating and maintenance procedures,

ii) Material change and

iii)Process-equipment modification.

Improvements in the operation and maintenance of process equipment can result in significant waste reduction. This can be accomplished by reviewing current operational procedures or lack of procedures and examination of the production process for ways to improve its efficiency. Instituting standard operation procedures can optimise the use of raw materials in the production process and reduce the potential for materials to be lost through leaks and spills. A strict maintenance program, which stresses corrective maintenance, can reduce waste generation caused by equipment failure. An employee-training program is a key element of any waste reduction program. Training should include correct operating and handling procedures, proper equipment use, recommended maintenance and inspection schedules, correct process control specifications and proper management of waste materials.

Hazardous materials used in either a product formulation or a production process may be replaced with a less hazardous or non-hazardous material. This is a very widely used technique and is applicable to most manufacturing processes. Implementation of this waste reduction technique may require only some minor process adjustments or it may require extensive new process equipment. For example, a circuit board manufacturer can replace solvent-based product with water-based flux and simultaneously replace solventvapor degreaser with detergent parts washer.

Installing more efficient process equipment or modifying existing equipment to take advantage of better production techniques can significantly reduce waste generation. New or updated equipment can use process materials more efficiently producing less waste. Additionally such efficiency reduces the number of rejected or off-specification products, thereby reducing the amount of material which has to be reworked or disposed of. Modifying existing process equipment can be a very cost-effective method of reducing waste generation. In many cases the modification can just be relatively simple changes in the way the materials are handled within the process to ensure that they are not wasted. For example, in many electronic manufacturing operations, which involve coating a product, such as electroplating or painting, chemicals are used to strip off coating from rejected products so that they can be recoated. These chemicals, which can include acids, caustics, cyanides etc are often a hazardous waste and must be properly managed. By reducing the number of parts that have to be reworked, the quantity of waste can be significantly reduced.

Volume reduction

Volume reduction includes those techniques that remove the hazardous portion of a waste from a non-hazardous portion. These techniques are usually to reduce the volume, and thus the cost of disposing of a waste material. The techniques that can be used to reduce waste-stream volume can be divided into 2 general categories: source segregation and waste concentration.

Segregation of wastes is in many cases a simple and economical technique for waste reduction. Wastes containing different types of metals can be treated separately so that the metal value in the sludge can be recovered. Concentration of a waste stream may increase the likelihood that the material can be recycled or reused. Methods include gravity and vacuum filtration, ultra filteration. Reverse osmosis, freeze vaporization etc.

For example, an electronic component manufacturer can use compaction equipments to reduce volume of waste cathode ray-tube.

Recovery and reuse

This technique could eliminate waste disposal costs, reduce raw material costs and provide income from a salable waste. Waste can be recovered on-site, or at an off-site recovery facility, or through inter industry exchange. A number of physical and chemical techniques are available to reclaim a waste material such as reverse osmosis, electrolysis, condensation, electrolytic recovery, filtration, centrifugation etc. For example, a printed-circuit board manufacturer can use electrolytic recovery to reclaim metals from copper and tin-lead plating bath.

However recycling of hazardous products has little environmental benefit if it simply moves the hazards into secondary products that eventually have to be disposed of. Unless the goal is to redesign the product to use nonhazardous materials, such recycling is a false solution.

Sustainable product design

Minimization of hazardous wastes should be at product design stage itself keeping in mind the following factors*

- *Rethink the product design:* Efforts should be made to design a product with fewer amounts of hazardous materials. For example, the efforts to reduce material use are reflected in some new computer designs that are flatter, lighter and more integrated. Other companies propose centralized networks similar to the telephone system.
- *Use of renewable materials and energy:* Bio-based plastics are plastics made with plant-based chemicals or plant-produced polymers rather than from petrochemicals. Bio-based toners, glues and inks are used more frequently. Solar computers also exist but they are currently very expensive.
- *Use of non-renewable materials that are safer:* Because many of the materials used are non-renewable, designers could ensure the product is built for re-use, repair and/or upgradeability. Some computer manufacturers such as Dell and Gateway lease out their products thereby ensuring they get them back to further upgrade and lease out again.

ITU – TECHNICAL GUIDELINES:

The technical guidelines along with environmental standards as recommended by ITU have been put forward to ensure that best practices are followed in handling ICT wastes.

The studies made by ITU –T study group 5 in the area of e-waste reduction, recycling methods and reuse of materials had been addressed by the recommendations as mentioned below :

S.No.	ITU-T specification Number	ITU-T specifications
1	ITU-T L.1000	"Universal power adapter and charger solution for mobile terminals and other hand-held ICT devices"- aims to reduce number of adapters and volume of e-waste.
2	ITU-T L.1001	Aims to reduce types of power adapters by widening the range of compatible devices, facilitating an adapter reuse and recycling. Describes the basic configurations and general requirements for universal power adapters and their interfaces: cables, connectors, current, voltage, resistibility, energy efficiency, electromagnetic compatibility.
3	ITU-T L.1100	A method to provide recycling information of rare

		metals in ICT goods
4	ITU-T L.1200	Direct current power feeding interface up to 400 V at the input to telecommunication and ICT equipment.
5	ITU-T L.1300	Describes best practices aimed at reducing the negative impact of data centers on the climate.
6	ITU-T L.1310	Defines energy efficiency metrics test procedures, methodologies and measurement profiles required to assess the energy efficiency of telecommunication equipment
7	ITU-T L.1400	Describes general principles on assessing the environmental impact of ICT and outlines the different methodologies that are being developed.
8	ITU-T L. 1410	Deals with the assessment of the environmental impact of ICT goods, networks and services
9	ITU-T L.1420	Provides specific guidance on energy and greenhouse gas (GHG) impacts

ITU has also come out with recommendation (L.1002) for environmentally friendly universal charger for laptops as well as other portable devices and of green batteries for

smart phones and other handheld ICT devices (L.1010).

A standardized methodology for manufacturers to report the quantity of rare metals contained in their ICT devices, has been agreed by experts in Recommendation ITU-T L 1101.

A study carried out in 2012 by the University of Genoa, ITU and the Global sustainability Initiative (Ge SI), estimates that the adoption of an energy-efficient universal power adapter will eliminate an estimated 300,000 tons of e-waste annually.

The study also shows that it could reduce the energy consumption and greenhouse gas emissions of external power supplies by between 25 and 50 per cent.

ITU has prescribed for installation of technical infrastructure for proper handling of e-waste, while considering the job opportunities for the informal sector. Use of technology for recovery, reuse, disposal of WEEE in an environment friendly manner will be effective when the concerns of the national economy and society are also taken care of . Collection of information at different stages of e-waste management is also important for having control on adverse effects on population and environment.

ITU- PRESENT ACTIVITIES:

The concept of environmental sustainability is having enormous importance these days as the activities towards bridging the digital divide in developing regions have resulted an alarming deterioration of the environmental condition.

To ensure the safety of mankind and environment, handling of e-waste has been assigned priority by nations based on international regulations and guidelines. ITU-T has already published a toolkit on the environmental sustainability for the ICT sector that provides technical guidelines on design for the environment principles and best practices. It also aims to build ‘sustainable products’ and ‘sustainable buildings’ through environmentally conscious design principles. The document covers issues of ‘end of life management’ and

explores development of sustainability framework through various standards and guidelines.

ITU has joined PACE (Partnership for Action on Computing Equipment), a multi stake holder partnership which intends to increase the environmentally sound management of used and end-of-life computer equipment taking into account social responsibility and the concept of sustainable development.

ITU has also joined the StEP (Solving the e-waste Problem) initiative for scientific assessment and incorporation of a comprehensive view of the social, environmental and economic aspects of e-waste. It conducts research on the entire life cycle of EEE and fosters eco- friendly and energy-efficient re-use and recycling practices in a socially responsible manner.

Further, the MPPI (Mobile Phone Partnership Initiative) guidelines provide information relating to the environmentally sound management of used and end-of-life mobile phones. ITU has organized workshops for capacity building on environmentally responsible management of WEEE aiming to develop standards and policies to be incorporated in national and regional e- waste management strategies.

SOURCE OF E-WASTE

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. Various government department, public as well as private sectors are fast feeding old electronics appliances such as computers, telephones, etc., into the waste stream

a. Individual household and small business
b. Large business, Institutions, government house and Foreign Embassies
c. PC manufacturers and retailers

d. E waste from imports

e. Secondary market of old PCs

PERCENTAGE OF SOURCES CONSTITUTING E – WASTE:

E-WASTE FROM INDIVIDUAL HOUSHOLDS –

As far as PCs emanating from individual households are concerned, it is difficult to know the exact quantity. Individual households are not major contributors in India. They account for 22% of total computers in India. The rest of share, that is 78%, comes from the business sector.

E-WASTE FROM BUSINESS SECTOR

The business sectors (government department, public or private sector, MNC offices, etc.) were the earliest users of electronic products; today they account for 78 per cent of total installed PCs. Hence, they are the major producers of obsolete technology in India. It is observed that the total no of obsolete PCs emanating from business as well as from individual households will be around 1.38 million.

E-WASTE FROM MANUFACTORS & RETAILERS

PCs manufacturer and retailers are next on the list of contributors to the e- waste segment in India. The waste form this sector comprises defective IC chips, motherboards, cathode ray tubes and other peripheral items produced during the production process. It also includes defective PCs under guarantee procured from consumer as replacement items. It is estimated that around 1050 tons per year of waste comes from this sector.

E-WASTE FROM IMPORTS

The biggest sources of PC scrap are imports. Huge quantities of e-waste such as monitors, printers, keyboards, CPU's, projectors, mobile phones, PVC wires, etc. are imported. The computers thus imported are of all ranges, models and sizes, and functional as well as junk materials.

SECONDARY MARKET

These are the waste coming from the secondary market. It includes TV, computers, mobiles, electric boards etc.

CATEGORIES OF E-WASTE

The electrical and electronic equipment can be broadly categorized into following categories.

- Large household appliances (refrigerator, freezer, washing machine cooking appliances, etc.)
- Small household appliances (vacuum cleaners, watches, grinders, etc.)
- Consumer equipment (TV, radio, video camera, amplifiers, etc.)
- Lightning equipment (CFL, high intensity sodium lamp, etc.)
- Electrical and electronic tools (drills, saws, sewing machine, etc.)
- Toys, leisure, and sport equipment (computer/video games, electric trains, etc.)
- Medical devices (with the exception of all implanted and infected products radiotherapy equipment, cardiology, dialysis, nuclear medicine, etc.)
- Monitoring and control instruments (smoke detector, heating regulators, thermostat, etc.) Automatic dispensers (for hot drinks, money, hot and cold bottles, etc.)

PROBLEMS IN THE IMPLEMENTATION OF A STRATEGY ON ICT-WASTE:

Countries mainly developing countries face different problems in framing or implementing regulations on e-waste:

There is no proper data about the consumption of ICT equipment, e-waste generated and managed through existing channels

- There is lack of proper policy that considers all aspects related to e-waste management including assignment of responsibilities for all stakeholders.

- Many developing countries have regulations but inadequate, as the practical socio economic situations are not taken care of.

- Moreover, some stakeholders like the informal sector are not considered when in developing countries, they form a substantive part of the recycling process.

- In developing countries the import of used ICT goods impose again a threat on the volume of e-waste generated.

- Lack of knowledge and absence of technology in different stages of e-waste management may lead to loss of valued material and further imposing threat to health and environment.

- There is a lack of standard infrastructure in developing to deal with ICT waste

- Lack of awareness among stake holders and public in general about the responsible use of ICT goods.

- Lack of co-ordination among different stake holders in different stages of the ewaste management process.

CHAPTER 05

RESEARCH METHODOLOGIES

RESEARCH METHODOLOGY

The methodology followed for the research:

Primary research detailed with E waste management firms and the parties attending corporate events**,** and attending the corporate meetings.

The Secondary information is gathered from E waste journals, books on E waste management and recycling processes.

The information gathered was studied and analyzed. It revealed some issues in E waste management which need further attention and some suggestion have been given to make this industry more effective in order to utilize its full potential and be mutually beneficial for the E waste management firms, the corporates and customers.

RESEARCH DESIGN

A research design is purely and simply the framework of plan for study that guides the collection and analysis of data.

TYPE OF RESEARCH: DESCRIPTIVE RESEARCH

Descriptive study is a fact-finding investigation with adequate interpretation. It is the Simpest type of research and is more specific. Mainly designed to gather descriptive information and tion for formulating more sophisticated studies.

Nature of the study

Quantitative- Quantitative research is objective, elaborate and many a times, investigational in nature. The results achieved from this research method are logical, statistical and unbiased.

SOURCES OF INFORMATION

1. Primary Sources
2. Secondary Sources

Primary Sources

The methodology followed for the research:
Primary data is a data that is collected for the first time in the processing of the analysis.
We have adopted the contact questionnaire for the purpose of collecting primary data.

Apart from this, information gathered was by personal interactions for the purpose of analyzing the have adopted the contact questionnaire for the purpose of collecting Primary data. Apart Awareness of E waste management companies in India.

Secondary Sources

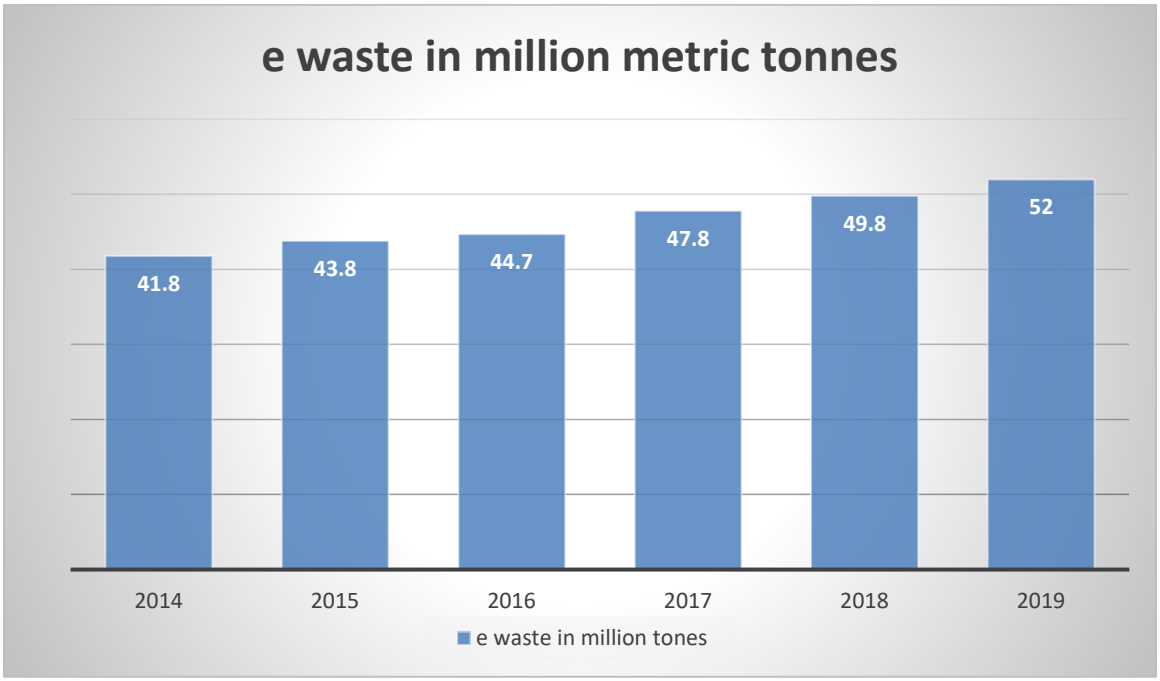
The Secondary data are those, which have already been collected and being processed through the statistical process.

The secondary information was gathered from various marketing journals and books On E WASTE , E WASTE management and E WASTE recycling.

CHAPTER 06

DATA ANALYSIS AND ITERPRETATION

GLOBAL E WASTE GENERATED

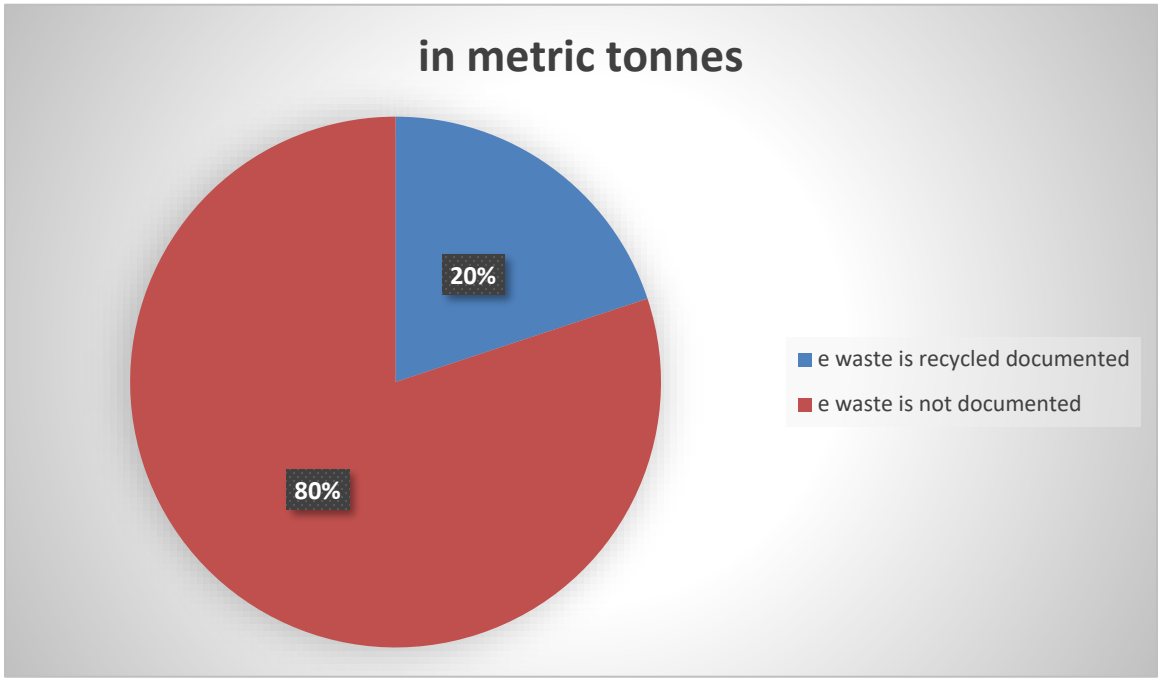


INTERPRETATION

According to above study I have observed that the population of the world is generating more e wastes year by year

E-WASTES ARE RECYCLED IN 2016

- 20% (8.9 Mt) of e-waste is documented to be collected and properly recycled
- 80% (35.8 Mt) of e-waste is not documented - 4% (1.7 Mt) of e-waste in the higher income countries is thrown into the residual waste - The fate of 76% (34.1 Mt) of e-waste is unknown; this is likely dumped, traded, or recycled under inferior conditions

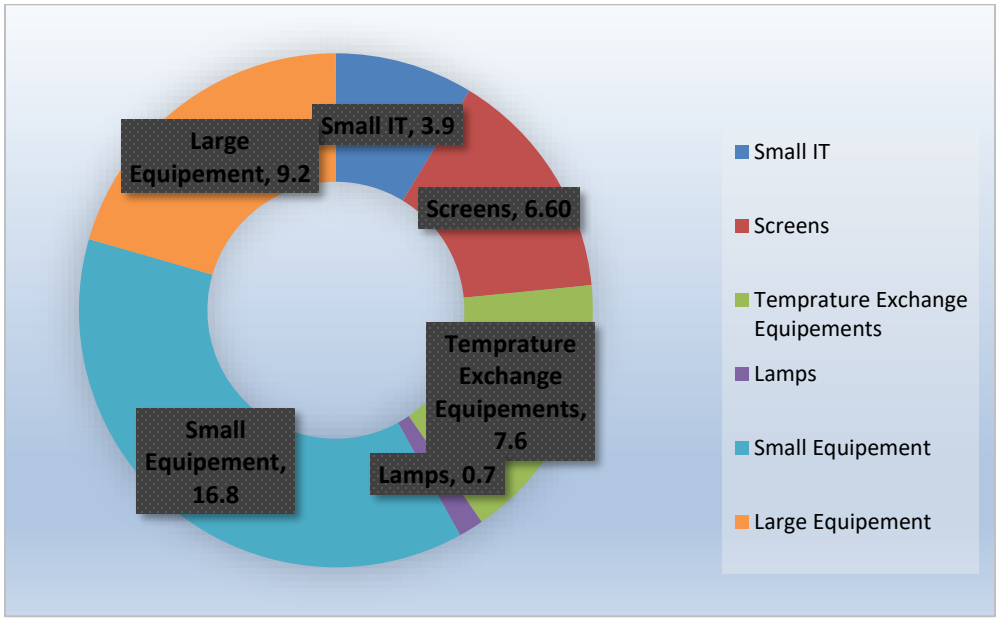


INTERPRETATION

From above study I have observe that very few amount of generated waste is recycled and officially documented

EVALUATED E WASTE OF 2016

44.7 Million Metric Tonnes generated in 2016

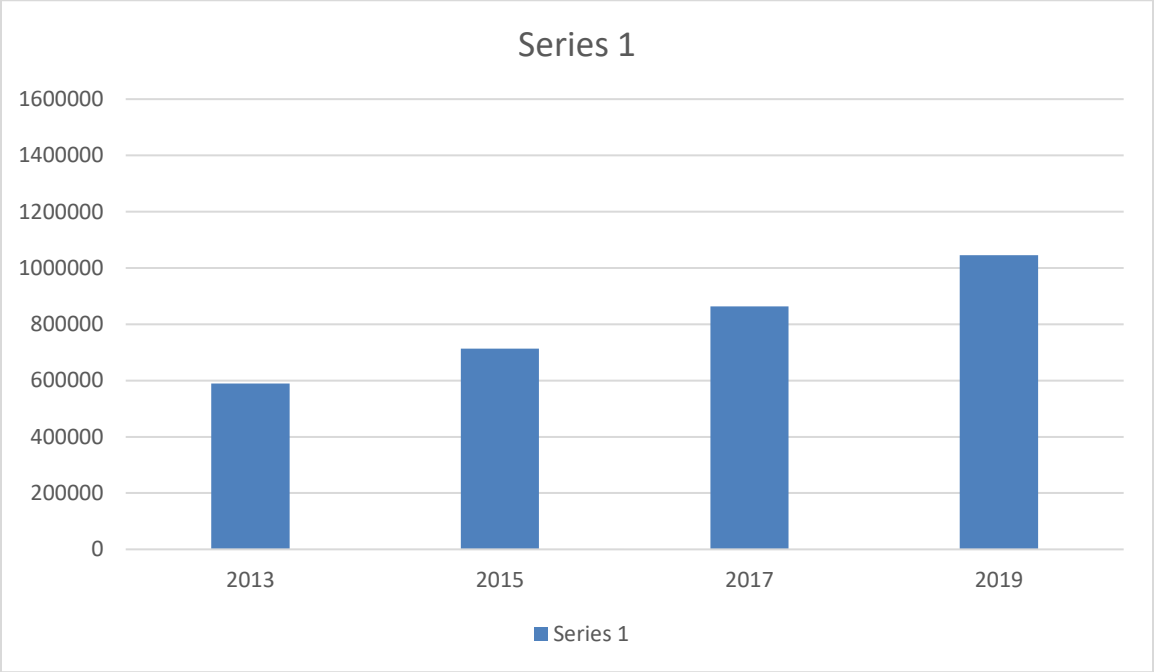


INTERPRETATION

People around the globe most often uses small equipements and hence small equipements such as cell phones, ipods, psp gaming consoles and earphones are produced in large amount.

INDIAN SCENARIO FOR E-WASTE MANAGEMENT:

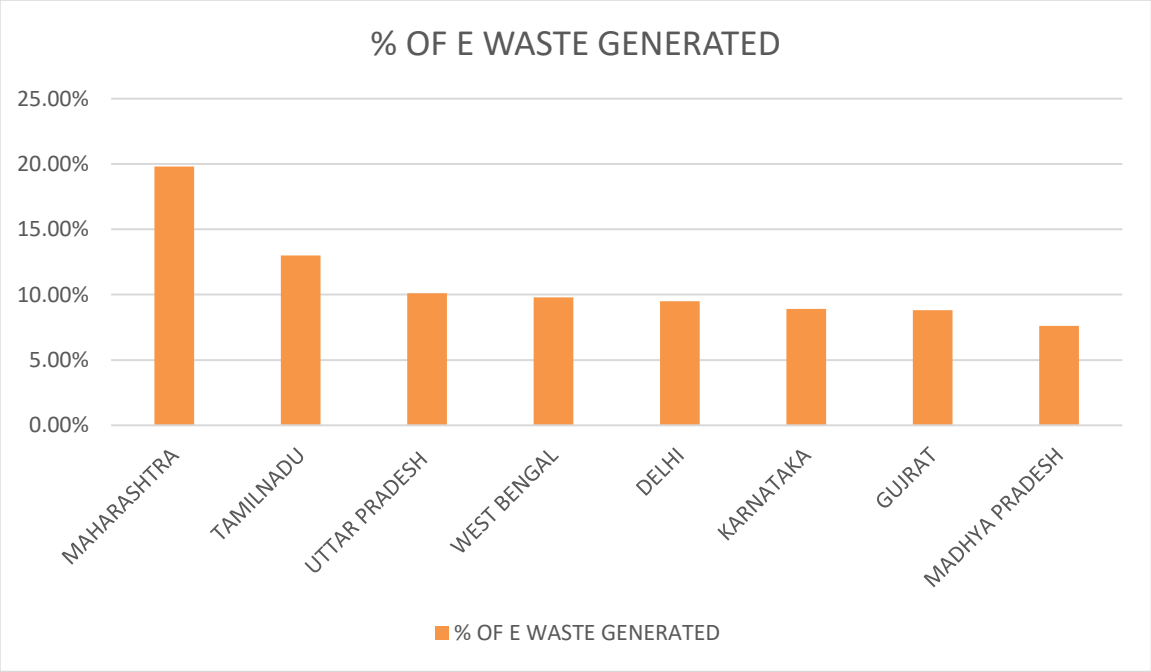
E WASTE GENERATED IN INDIA



INTERPRETATION

From above figure we can conclude that India is emerging producer of E waste and now India ranked in top five E wastes generators

E WASTE GENERATED BY CITIES IN INDIA:

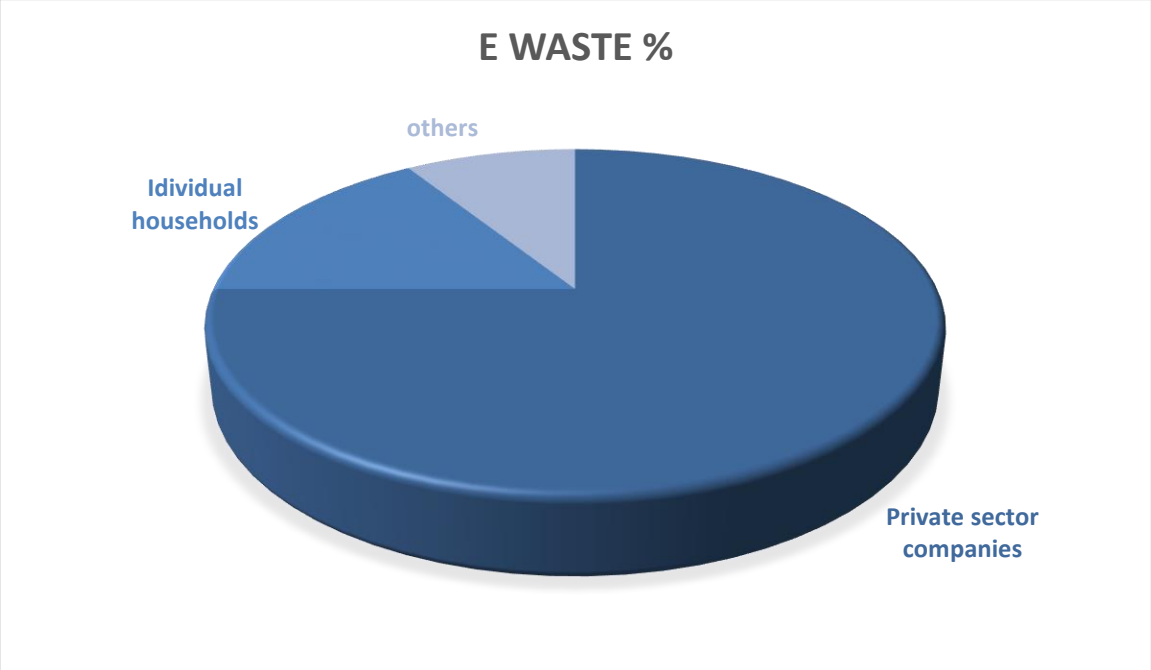


INTERPRETATION

From above study I have observe that the Maharashtra and tamilnadu states are leaders in making E wastes

Additionally, e-waste is disproportionately generated in urban areas—65 Indian cities generate more than 60% of India's total e-waste. Mumnbai is the top e-waste producer followed by Delhi, Bengaluru, Chennai, and Kolkata.

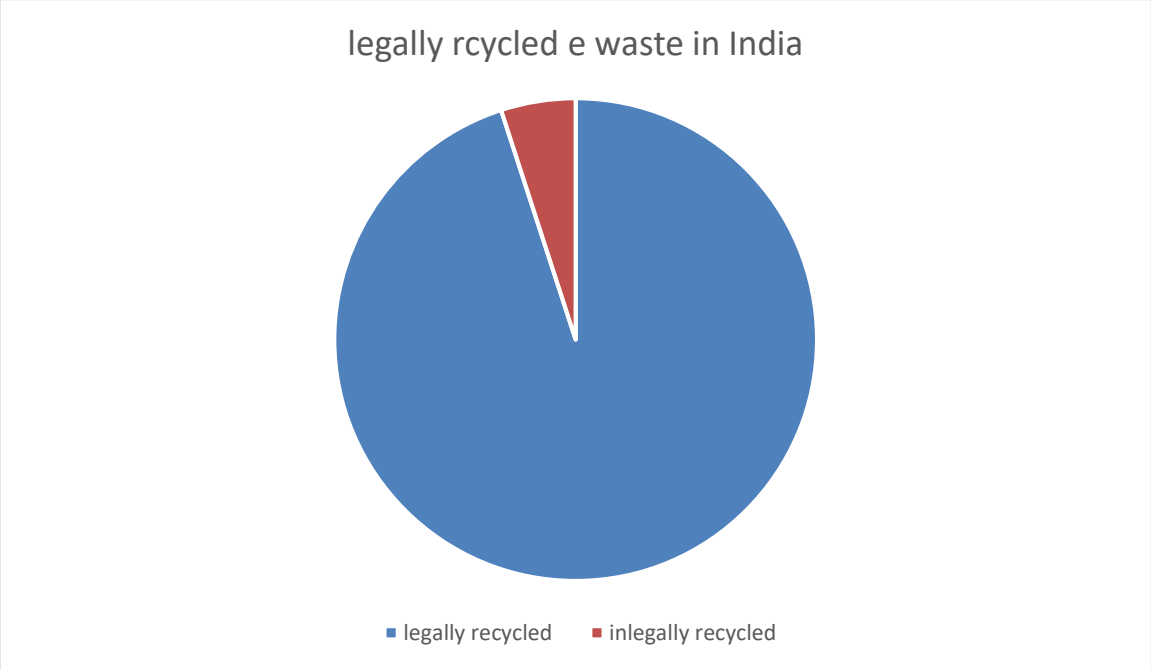
CLASSIFIED E WASTE OF INDIA BY SOURCES



INTERPRETATION

Above study conclude that Private sector companies make huge amount of E wastes

HOW MUCH E WASTE IS LEGALLY RECYCLED:

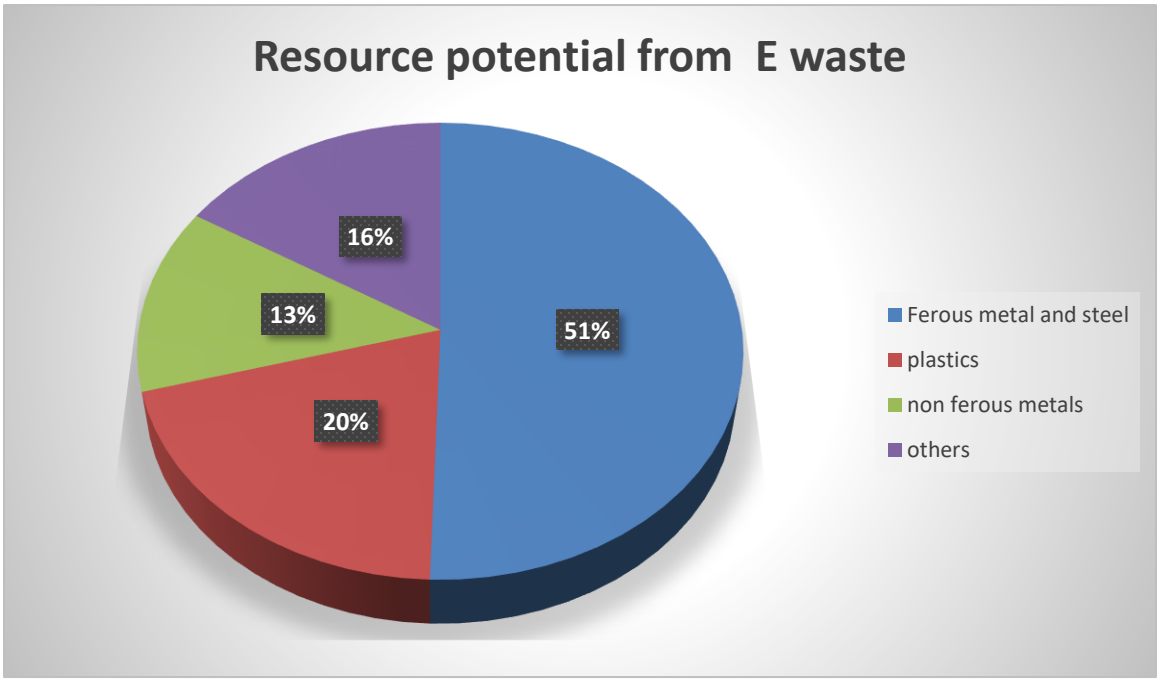


As per the study of UN report the amount of E waste is recycled in informal sector and in crude manner

INTERPRETATION

Because of improper management or rules and regulation the E waste generated in India Recycled In wrong way

COMPOSITION OF E WASTE:



INTERPRETATION

From above study I have observed that the we can obtain large amount of Ferous metal and steel as well as plastics and non Ferous metals

Composition of e waste :

- Ferous metal and steel
- Plastics
- Ferous metals
- Glass
- Wood
- Circuit boards
- Ceramics and concrete
- Rubber and other items

CHAPTER 07

HAZARDS ASSOCIATED WITH E-WASTE

HAZARDS ASSOCIATED WITH E-WASTE

WEEE should not be combined with unsorted municipal waste destined for landfills because electronic waste can contain more than 1000 different substances, many of which are toxic, such as lead, mercury, arsenic, cadmium, selenium, and hexavalent chromium. Some of the toxic effects of the heavy metals are given below.

Lead

Lead causes damage to the central and peripheral nervous systems, blood systems, kidney and reproductive systems in humans. The main applications of lead in computers are: glass panels and gasket (frit) in computer monitors, and solder in printed circuit boards and other components.

Cadmium

Cadmium compounds are toxic, they can bio accumulate, and they pose a risk of irreversible effects on human health. Cadmium occurs in certain components such as surface mound devices (SMD) chip resisters, infrared detectors, and semiconductor chips.

Mercury

Mercury can cause damage to various organs including the brain and kidneys. Most importantly, the developing fates is highly susceptible through maternal exposure to mercury. Mercury is used in thermostats, sensors, relays, switches (e.g. on printed circuit boards and in measuring equipment), medical equipment's, lamps, mobile phones, and in batteries.

Hexavalent chromium/chromium VI

Chromium VI is still used for corrosion protection of untreated and galvanized steel plates and as a decorative or hardener for steel housing. It easily passes through all membranes and is then absorbed---producing various toxic effects in contaminated cells.

Plastic including PVC

It is used in the cabling & computer housing. It contain dioxins. Reproductive and developmental problems, immune system damage, interface with regulatory hormones.

DIFFERENT TYPES OF ON- GRID SYSTEMS

Hazards due to Incineration

The incineration of brominated flame-retardants at a low temperature of 600-800 degree Celsius may lead to the generation of extremely toxic polybrominated dioxins (PBDDs) and polybrominated furans (PBDfs). Significant quantity of PVC is contained in e-waste, which makes the flue gas residues and air emissions particularly dangerous.

Hazards due to Land filling

It has become common knowledge that all landfills leak. Even the best "state of the art" landfills are not completely tight throughout their lifetimes and a certain amount of chemical and metal leaching will occur. The situation is worse for older or less stringent dump sites. Mercury will leach when certain electronic devices, such as circuit breakers are destroyed. The same is true for PCBs from a consider. When brominated flame retarded plastics or 11 cadmium containing plastics are land filled, both PBDE and the cadmium may leach into the soil and groundwater. It has been found that significant amounts of lead ions are dissolved from broken lead containing glass, such as the cone glass of cathode ray tubes, when mixed with acid waters which commonly occur in landfills.

Hazards due to recycling

Recycling of hazardous products has little environmental benefit. It simply moves the hazard into secondary products that will have to be disposed of eventually. Unless the goal is to redesign the product to use non-hazardous materials, such recycling is an ineffective solution. Halogenated substance contained in e-waste, in particular brominated flame-retardants are also of concern during the extrusion of plastics, which is a part of plastic recycling. Environmental problems during the recycling of e-waste are not only linked to halogenated substances. A hazardous emission into the air also result from recycling of e-waste containing heavy metals, such as lead and cadmium. These emissions could be significantly reduced by means of pre-treatment operation. Another problem with heavy metals and halogenated substances in untreated e-waste occurs during the shredding process. Since most of e-waste are shredded without proper disassembly, hazardous substances, such as PCB containing in capacitors, may be dispersed into the recovered metals and the shredder waste.

CHAPTER 08

METHODS OF TREATMENT & DISPOSAL

METHODS OF TREATMENT & DISPOSAL

LANDFILLING

In this method a ditch is dug in the soil and the soil is excavated from it. The e-waste is then buried in the ditch and then covered by a thick layer of soil. This is one of the most widely used methods of disposing off e-waste. The e-waste takes a lot of time to be degraded in this case as the process of degradation in the case of landfills is very complex and take a long time. However, disposal of e-waste by landfilling is not entirely safe for the environment as certain metals like cadmium can leach into the soil and ground water.

INCINERATION

In this process controlled and complete combustion of e-waste is carried out in which the waste material is burned in specially designed incinerators at a high temperature (900-1000oC). The main benefit of incineration of e-waste is the reduction of waste volume and the utilization of the energy content of combustible materials. Some of the recycling plants remove iron from the slag for recycling purposes. During incineration some environmentally hazardous organic substances are converted into less hazardous compounds. The main problem with incineration is the emission to air of substances escaping flue gas cleaning and the large amount of residues from gas cleaning and combustion

PYROLYSIS & GASIFICATION

Pyrolysis works on the same methodology as incineration ie, burning solid waste at high temperatures to compose its size. Pyrolysis differs from incineration in the aspect that solid waste is burned in the absence of oxygen. Gasification, on the other hand, allows a low supply of oxygen to convert waste in to combustible and non-combustible gases along with some liquids. The end material can then be used as heat energy, and the left over waste can then be taken for landfilling which will take comparatively lesser space.

LANDFILLING & DUMPS

Landfills and dumps are used to store waste materials beneath the soil, In many causes, remnants of waste material are not disposed even during the process of incineration, pyrolysis, and gasification. These waste materials are transported to landfills and dumps.

Many landfills/dumps are also designed in such as way that energy releases during the process of decomposition of e-waste is tapped and used for generating power. But landfills make soil become polluted

E-WASTE EXISTING MANAGEMENT PRACTICES IN INDIA

Plastic waste

Products made from plastics such as like casing, front panel, and rear panel. Miscellaneous parts encased in plastics. Management practice-The shredding & melting.

Printed circuit board waste Used in the fire inhibitors & in some electronic parts. Management practice- Desoldering & open burning to remove metals.

Miscellaneous waste

Chips, electronic wire, broken glass waste, copper containing waste. Management practice – Chemical stripping & open burning & some of the waste is mixed with the municipal solid waste

Liquid waste

It contain internal chemicals, general waste, and acid stripping waste. Management practice –Sewerage system

RECYCLING OF E-WASTE

WEEE recycling is in its infancy, and consumer recognition of the need for recycling is a critical factor in the further expansion of this industry. More than 90% of WEEE is landfilled, and in other countries a large fraction of WEEE waste from households ends up in waste incinerators. Many consumers do not immediately discard or recycle unused electronics, since they think that the products retain value. More than 70% of retired CEDs are kept in storage for 3-5 years. However, with the rapid development of electronic technologies, the residual value of outdated electronic devices decreases rapidly as machines and devices age. Consumers also need to be educated about the effects of such waste on the environment and health, and learn the significance of the recycling symbol that must appear on the packaging of such equipment.

Recycling of WEEE can be divided into three major stages.

DISASSEMBLY/DISMANTLING

Disassembly is the systematic removal of components, part, a group of parts or a subassembly from a product (I.e. partial disassembly) or the complete disassembly of a product for a given purpose. This is often necessary to isolate hazardous or valuable materials

UPGRADING

WEEE can be regarded as a resource of metals, such as copper, aluminium and gold, and non-metals. Upgrading typically includes two stages: combination and separation of metals using mechanical/physical and /or metallurgical processing to prepare the materials for refining processes. Precious metal oriented recovery techniques, such as hydrometallurgy and pyro metallurgy, are becoming less popular whereas mechanical / physical separation of WEEE, which are easier to operate and more environmentally sound, are becoming more prevalent. Other methods to recover materials include incineration and refining, in which metal can be recovered after the more combustible material has been incinerated; and chemical recycling, in which chemical processes are used to remove precious metals such as gold and silver from printed circuit boards.

A mechanical processes is an ideal for upgrading recycling WEEE because it yield full material recovery including plastics. Sometimes products will be dismantled to remove the 15 hazardous components and then the remaining material will be granulating and shredded in order to remove the recyclable raw materials such as plastic and ferrous metal. Shredded is often used to produce small even fine-sized particles; usually below 10mm. Many of the traditional recycling processes, such as screening, shape separation and magnetic separation can be used for particle separation.

MATERIAL RECOVERING

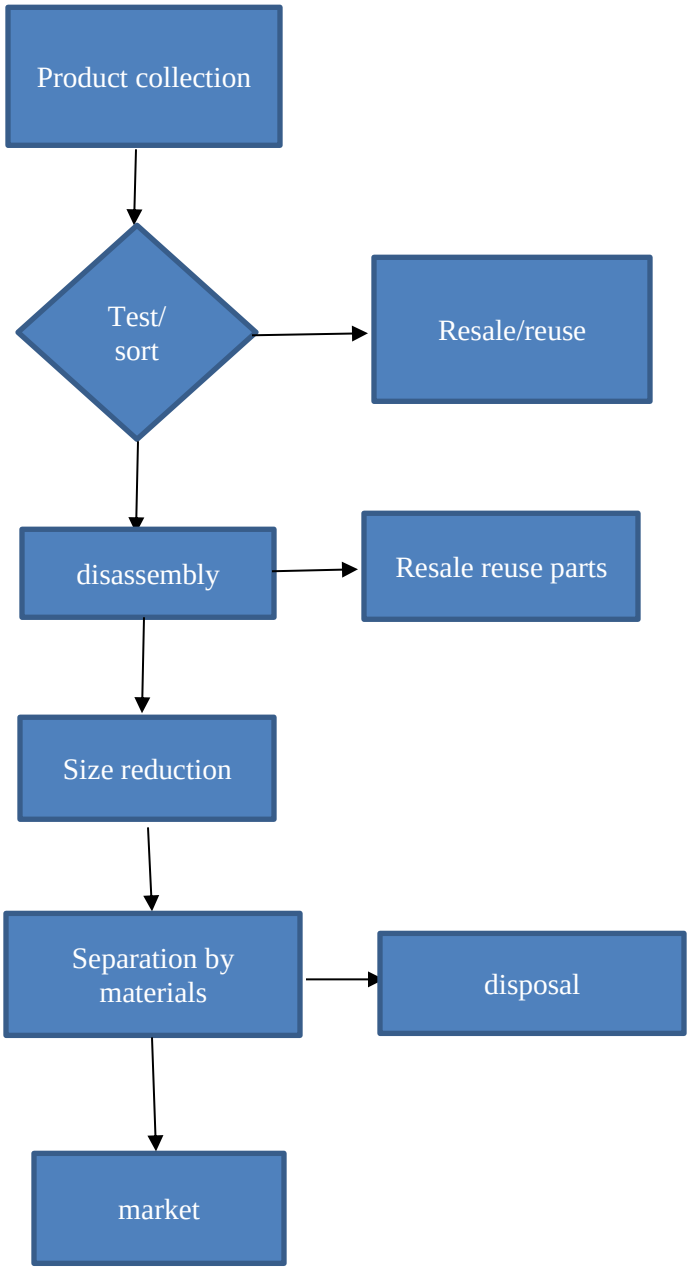
The major materials in TV and computer are metals, plastics, and glass, and the rate at which these materials can be recovered at a given materials recycling facility (MRF) will depend on varies parameters such as the size of the facility and the target electronics products.

PRODUCT REUSE

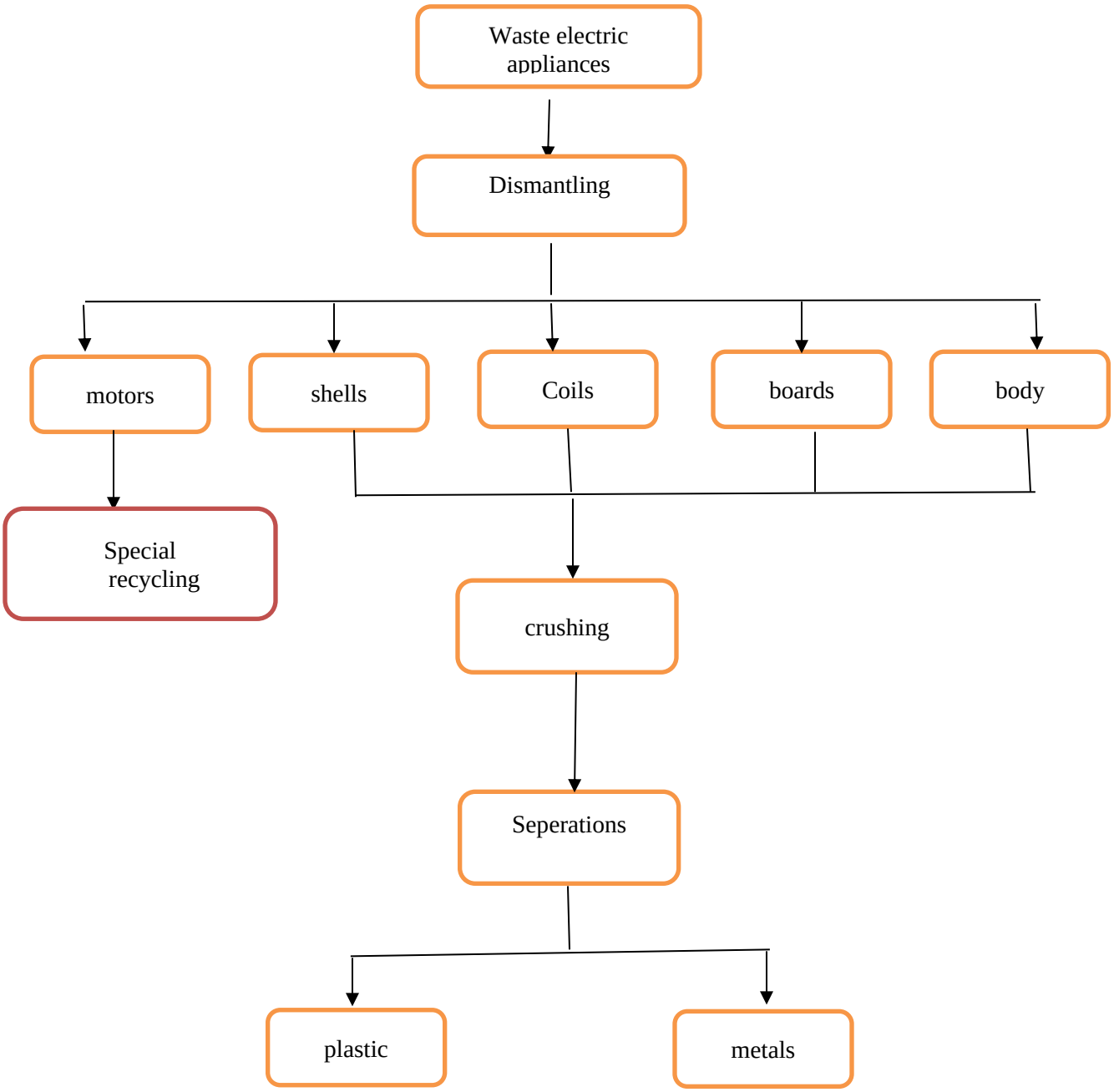
Reuse is the environmentally preferable option for managing older electronics equipment. By extending the useful life of old products, reuse conserves the energy and raw materials needed to manufacture new products and doing so reduces the pollution associated with energy use and manufacturing. Reuse also gives people who cannot afford new products access to electronic equipment at reduced or at low cost. Almost all domestic and part of imported e-waste are reused in following ways :-

- Direct second hand use
- Use after repair or slight modification
- Use of some part like monitor cabinet main board for making new appliances.

PRODUCT RECYCLING PROCESS



E WASTES CLASSIFICATION PROCESS:



Concerns/ Challenges in e -waste management:

Following are the some of the major issues that need attention while handling e-waste:

- The data for information on e-waste is estimation and there is a problem in finding information on imports of e-waste. Most studies have concentrated on devices like mobile, computer and TVs while the domestic appliances also contribute to a considerable proportion of e-waste. There is a need to have credible data covering wide range of products across sectors
- Waste collection, transportation, processing and recycling is dominated by theinformal sector. The sector is well networked and unregulated. There are serious issues regarding leakage of toxins into the environment hampering workers' safety/ health.
- There is a need for establishment of collection channels for e-waste from thegenerator to the recycler. Presently as the standards are not followed by the collectors (mainly the informal sector), the environmental, health and safety norms are hampered. The formal sector having large infrastructure and high operational cost finds difficulty in competing with the informal sector.
- The informal sector needs specific attention to be handled properly considering the socio economic condition so that the solutions for environment friendly management of e-waste are found to be rational for the stake holders
- There is a lack of fund and capacity in Government for monitoring and enforcement of the regulations
- Awareness regarding the hazards of e-waste is low because of structural deficiency in implementation of policies, poor literacy and poverty of an important major stake holder (informal sector)
- The e-waste management system is mostly manual and low tech and the 'take back' by producers is limited to few IT equipment and few formal collection centres. There is lack of effort from producers that results in limited implementation of EPR. In absence of accountability and penalty criteria in the regulation, it is difficult to monitor the EPR activities.

POLICY ISSUES: E-WASTE HANDLING AND MANAGEMENT RULES-2011

'E-WASTE HANDLING AND MANAGEMENT RULES-2011' have become effective from 1st MAY 2012. Rules would be applicable to every producer, consumer and bulk consumer involved in manufacture, sale, purchase and processing of electronic equipment or components. Under these rules the producers and the bulk consumers have to recycle the Ewaste or help in channelizing the e-waste to only the authorised recyclers.

Some suggestions and issues raised by participants:

- Managing e-waste, and other kinds of waste, is essential for the transition to a low-carbon, resource-efficient Green Economy, all the speakers emphasized.
- Formal and informal sector recyclers should work together as this would benefit both the parties.
- Informal sector can use the recycling facilities and infrastructure of formal and organized sector
- Technology adoption and modernization is needed for informal sector enterprises to get benefited from this sector.
- Informal sector needs financial and technological assistance to compete in the emerging scenario
- Banks should be ready to fund informal sector so that they would be financially empowered to get required technology.
- Agencies and government should help informal sector in availing best technology from developed world.
- SME e-waste recyclers in the organized sector also finding it difficult to get e-waste and are faced with declining profit.

CHAPTER 09 BENEFITS OF RECYCLING E-WASTE

BENEFITS OF RECYCLING E-WASTE

- It protects the environment

  Recycling e-waste can keep a range of harmful materials out of the environment. Lighting, including fluorescent tubes and lamps, contains toxic mercury that can leach into waterways when it is thrown into landfill.

- It reduces business costs

  E-waste recycling is not only good for mother nature, it can also be good for a business' bottom line. Most state and territory governments have now incentivised e-waste recycling by hiking the cost of dumping or outright banning it.

- It supports non-renewable recycling

  The growing demand for electronic devices and appliances means a range of metals and other non-renewable resources need to be mined and processed. However, many of the materials used to make smartphones, appliances and other e-waste can be re-used again. These resources include steel, aluminium, copper and gold — not to mention large amounts of plastic that can be turned into new products.

- It shows your eco-friendly credentials

  Employees increasingly want to work for businesses that do their part for the environment and the community.Recycling is a simple and tangible way to demonstrate your organisation's commitment to social and environmental values, and reinforces those principles to your employees.

- It's super easy to recycle e-waste

  Recycling e-waste has never been easier. There are a range of places and businesses where you can drop off an old phone, TV or other household appliances

CHAPTER 10 FINDINGS

FINDINGS

- It is estimated that 50 million tonne of e-waste will be generated globally in 2018.
- Half of this is personal devices such as computers, screens, smartphones, tablets and TVs, with the remainder being larger household appliances and heating and cooling equipment.
- Out of this, only 20 per cent of global e-waste is recycled each year, which means that 40 million tonnes of e-waste is either placed in landfill, burned or illegally traded and treated in a sub-standard way. This is despite 66 per cent of the world's population being covered by e-waste legislation.
- There is no propper Disposal technology to Dispose huge amount of E waste.
- In India, the lack of an updated inventory of e-waste generated makes it difficult to quantify the e-waste recycled and disposed.
- This increase in quantity of e-waste is because of increased consumption.
- As per above study I have observe that users discard old computers, mobiles and other equipment much faster than before.
- Zero awareness about e-waste and its recycling, as well as the role of the unorganised sector are the added challenges to the problem.The base metals which can be reused are lost and results soil contamination due to unorganised and crude dismantling.
- We can obtain some precious elements from the Recycling E wastes to make the Reuse of them.

CHAPTER 11 LIMITATIONS

LIMITATIONS

- Recycling tons of garbage will require separate factories.
- Recycling will produce pollutants, including chemical stews after breaking down the waste materials.
- Recycling is not always cost-efficient.
- Recycling can increase low quality jobs
- Recycling can create more environmental problems, if not done right
- Recycling does not guarantee good quality products
- Recycling can give people a false sense of security.
- children exposed to harmful waste & chemicals
- many people poisoned by e-waste
- e-waste contains lead, mercury, etc.
- no safety laws
- most of our e-waste shipped to other countries
- takes up a lot of space
- can cause death
- effect on respiratory, urinary, and digestive system
- 35-40 years old, incapable of working

CHAPTER 10 CONCLUSION

CONCLUSION

Electronic and electrical equipments cannot be avoided in today's world. So also is the case of waste electronic and electrical equipments. As long as this is a necessary evil, it has to be best managed to minimize its adverse impacts on environment. Through innovative changes in product design under EPR, use of environmentally friendly substitutes for hazardous substances, these impacts can be mitigated. A legal framework has to be there for enforcing EPR, RoHS for attaining this goal. Adoption of environmentally sound technologies for recycling and reuse of e-waste along with EPR and RoHS offers workable solution for environmentally sound management of e-waste.

CHAPTER 11

APPENNDICES

BIBLIOGRAPHY

- Solid and Liquid waste management
- Municipal solid waste ,management
- Products from waste Technology hand book
- Wealth from waste

WEBLIOGRAPHY

- www.Wikipedia.com
- www.Google.com
- www.downtoearth.org.in
- www.Elsvier.com