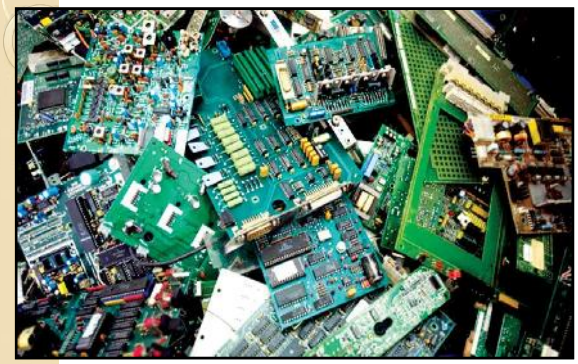
E-WASTE

WHAT IS E-WASTE ?

- E-waste or *waste electrical and electronic equipment (WEEE)* includes surplus, obsolete, or broken electrical or electronic devices.
- E-waste means any waste from electrical or electronic equipment, whole or in parts, or rejects from their manufacturing and repair processes, which are intended to be discarded.
- While mainly interested in precious metals (such as copper, silver, and platinum), recyclers are also interested in glass, plastic, and batteries within these devices.
- Its quantum is increasing yearly, and disposal of e-waste is becoming a global environmental and public health issue.

- According to a study, India generates annually about 3,80,000 tonnes of e-waste, which is expected to increase manifold.
- The study also reveals that only about 6% of e-waste is recycled, of which 95% is operated through the informal sector.
- Currently applied processes for recycling WEEE are largely unscientific and environmentally unsound, hence posing serious health threats.
- It will be a challenge to reorganise the recycling of WEEE to establish recycling methods that protect both workers and the environment.
- One option would be the introduction of the *extended producer responsibility (EPR)* concept, where the producer of an electrical or electronic device guarantees product redemption after use through recycling or disposing it in an environmentally friendly way.



E-WASTE CATEGORIES

E-waste is classified into two categories :-

WASTE CATEGORY	WASTE STREAM	TYPE OF E-WASTE
Category I	Information technology and telecommunicatio-n equipment	technology and telecommunication equipment Centralised data processing: Mainframes, Minicomputers; Personal Computing: Personal Computers (Central Processing Unit with input and output devices); Personal Computing: Laptop Computers (Central Processing Unit with input and output devices); Personal Computing: Notebook Computers, Notepad Computers; Printers including cartridges; Copying equipment; Electrical and electronic typewriters; User terminals and systems; Facsimile; Telex; Telephones; Pay telephones; Cordless telephones; Cellular telephones and Answering system
Category II	Consumer electrical and electronics	Television sets (including sets based on (Liquid Crystal Display and Light Emitting Diode technology); Refrigerator; Washing Machine; Air-conditioners excluding centralised air conditioning plants; Fluorescent and other mercury containing lamps.

- E-waste consists of more than 1000 different components which can be categorised as "hazardous" and "non-hazardous".

Typically, e-waste consists of:

1) ferrous metals (approximately 50%)
2) plastics (approximately 21%)
3) non-ferrous metals like copper, aluminium, silver, gold, platinum, palladium etc. (approximately 13%)
4) other components like glass etc. (approximately 16%).

- Most plastic components in e-waste include phthalate plasticiser and brominated flame retardants, which are hazardous.
- Therefore, even though the plastic recovery potential from e-waste can be quantified, presence of above mentioned chemicals limits the actual recycling potential.

E-WASTE MANAGEMENT RULES, 2016

- According to Schedule IV of the E-Waste Management Rules, 2016, the responsibilities of the Urban Local Bodies are:

a) To ensure that e-waste if found to be mixed with MSW is properly segregated, collected and is channelised to either authorised dismantler or recycler.

b) To ensure that e-waste pertaining to orphan products is collected and channelised to either an authorised dismantler or recycler.

Municipal authorities must therefore give basic education to their staff on identification of e-waste and on measures to be taken when they find such a waste mixed with municipal solid waste.

- These rules are based largely on the principle of Extended Producer Responsibility (EPR), which assigns the producer with the responsibility of 'end-of-life' management of the electrical and electronic equipment .
- The **objective of the rules** is to put in place an effective mechanism to regulate the generation, collection, storage, transportation, environmentally sound recycling, treatment and disposal of the e-waste.
- It is mandatory that e-wastes be managed in accordance with provisions under these rules.

Bruhat Bengaluru Mahanagara Palike (BBMP)

- Bruhat Bengaluru Mahanagara Palike (BBMP) is adopting a three-bin system for collection of wet, dry, and e-waste.
- More than 10 collection bins for e-waste disposed of by citizens have been set up in the city.
- Citizens are required to bring e-waste to these locations.
- E-waste collected from these bins is recycled by authorised recyclers in an environmentally sustainable manner.

CURRENT STATUS OF E-WASTE GENERATION AND ITS MANAGEMENT

- Electronic waste is one of the fastest growing waste streams in the country with a growth rate of 10% per annum.
- An increase in the use of electrical and electronic products and their high rate of obsolescence leads to generation of huge amounts of electrical and electronic waste (e-waste).
- As per preliminary estimates of the Central Pollution Control Board (CPCB), e-waste generation in India was *0.8 million tonnes in 2012*.

E-waste produced across the world

- The world produces as **much** as 50 million tonnes **of electronic** and electrical **waste** (**e-waste**) a year, weighing more than all of the commercial airliners ever made.
- Only 20% of this is formally recycled.
- The **e-waste produced** annually is worth over $62.5 billion, more than the GDP of most countries

Source : UN report,Jan 24, 2019

SHORTCOMINGS OF E-WASTE MANAGEMENT PRACTICES IN INDIA

E-waste management practices in India are beset with numerous shortfalls, such as :

a) Difficulty in maintaining an inventory of generated e-waste
b) Unhealthy conditions of informal recycling
c) Inadequate capacities
d) Lack of awareness among generators and ULBs.

The following three E-Waste streams are not covered under the Schedule I of the E-Waste Management Rules, 2016:

1) Batteries used in electrical and electronic equipment, such as Ni-Cd, Li-ion, Mercury etc.
2) Dry cell batteries
3) Compact Fluorescent Lamps

- It is very likely that these components are found in municipal solid waste (MSW) despite their inherent recycling potential (since no vendor pays for them).
- Local authorities (like Ahmedabad Municipal Corporation) has started an initiative of collecting these wastes separately or as part of the special waste stream or mixed with dry waste (where special waste is not collected separately).
- This special waste is disposed appropriately in a separate designated portion of the sanitary landfill.

HAZARDOUS WASTE

WHAT IS HAZARDOUS WASTE ?

- Special waste including domestic hazardous waste comprises of *any solid waste or a combination of solid wastes that requires special handling and disposal because of its quantity, concentration, physical and chemical characteristics, or biological properties, in order to protect human health, as well as the environment and to exploit its potential for recycling.*
- In line with this definition, the following waste are defined as special waste:

1) Plastic waste
2) Bio-medical waste
3) Slaughterhouse waste
4) Electric and electronic waste (e-waste)
5) Waste tyres
6) Battery waste

Special Wastes including Domestic Hazardous Wastes Categories from Households

- Printer cartridges, electronic parts and equipment
- Batteries from flashlights and button cells
- Bleaches and household kitchen & drain cleaning agents
- Car batteries, oil filters and car care products, consumables
- Chemicals and solvents and their empty containers
- Insecticides, pesticides and herbicides and their empty containers
- Light bulbs, tube-lights and compact fluorescent lamps (CFL)
- Paints, oils, lubricants, glues, thinners, and their empty containers
- Photographic chemicals
- Thermometers and other mercury containing products
- Discarded medicines, injection needles and syringes, after destroying them

Characteristics of hazardous waste

- Special wastes including domestic hazardous wastes can pose a substantial or potential threat to health and environment because of their constituents which may be hazardous.
- A municipal waste component is hazardous if it contains one of the following characteristics:

i. ignitability
ii. corrosivity
iii. reactivity
iv. Toxicity
v. Lead concentration ≥5000 mg/kg
vi. Sulphides ≥20,000 mg/kg
vii. Benzene concentration ≥50 mg/kg

TRANSPORTATION OF HAZARDOUS WASTE

- The Hazardous Wastes Rules set out responsibilities for various actors in the disposal and transport of hazardous waste.
- These include some general responsibilities for occupiers, who must:

1. Send or sell hazardous waste only to a registered recycler or an authorized disposal facility
2. Transport hazardous waste in accordance with the rules
3. Provide required information to an operator of a TSDF

RESPONSIBILITIES OF A TRANSPORTER

1) Obtain an EPA ID number
2) Comply with the manifest system requirements
3) Appropriately address any hazardous waste discharges
4) Only take hazardous wastes to TSDFs designated by the generator

IMPORTANCE OF PROPER HAZARDOUS WASTE MANAGEMENT

- Scientific disposal of hazardous waste through collection, storage, packaging, transportation and treatment, in an environmentally sound manner minimises the adverse impact on human health and on the environment.
- The hazardous waste can be disposed at captive treatment facility installed by the individual waste generators or at Common Hazardous Waste Treatment, Storage and Disposal Facilities (TSDFs).
- There are 40 Common Hazardous Waste Treatment, Storage and Disposal Facilities (TSDFs) available in 17 States/UTs.
- Hazardous waste such as lead acid battery scraps, used oil, waste oil, spent catalyst etc. and other waste such as waste tyres, paper waste, metal scrap etc. are used as raw material by the industries involved in recycling of such waste and as supplementary resource for material and energy recovery.
- Accordingly, it is always preferable to utilise such waste through recycling, or for resource recovery to avoid disposal through landfill or incineration.
- There are about 1080 registered recyclers; 47 cement plants permitted for co-processing; and about 108 industries permitted for utilisation of hazardous waste.

PROBLEMS OF UNSCIENTIFIC DISPOSAL OF HAZARDOUS AND OTHER WASTE

- Unscientific disposal of hazardous and other waste through burning or incineration leads to emission of toxic fumes comprising of Dioxins & Furans, Mercury, heavy metals, causing air pollution and associated health-related problems.
- Disposal in water bodies, or in municipal dumps leads to toxic releases due to leaching in land and water entailing into degradation of soil and water quality.
- The workers employed in such unscientific practices suffer from neurological disorders, skin diseases, genetic defects, cancer etc.
- Hence, there is a need for systematic management of hazardous and other waste in an environmentally sound manner by way of prevention, minimisation, re-use, recycling, recovery, utilisation including co-processing and safe disposal of waste

SPECIAL WASTE MANAGEMENT INCLUDING DOMESTIC HAZARDOUS WASTE – GUIDANCE FROM THE INTEGRATED SOLID WASTE MANAGEMENT (ISWM) HIERARCHY

- The integrated solid waste management (ISWM) hierarchy indicates that the next preferred waste management method to waste minimisation or reduction is reuse and recycling.
- Waste that cannot be reduced or minimised should be reused (resource recovery) and recycled.
- Some special wastes including domestic hazardous waste like plastics waste, electrical and electronic waste (e-waste) can be reused or recycled.
- On the other hand, slaughterhouse waste and biomedical waste should not be recycled and should be appropriately treated and disposed of to prevent hazardous impacts of undesirable dumping of these wastes.
- Recycling of special wastes including domestic hazardous waste provides economic as well as environmental benefits and reduces reliance on virgin materials.

STORAGE AND PROCESSING OF SPECIAL WASTES INCLUDING DOMESTIC HAzARDOUS WASTE

Special wastes including domestic hazardous wastes are generated by residential, commercial, or institutional facilities which are regulated by rules other than the SWM Rules, 2016 and consist of the fractions mentioned in Table 2.1 i.e.

- E-waste
- Hazardous waste
- Household medical waste
- Batteries from flashlights and button cells
- Lights bulbs, tube lights and Compact Fluorescent Lamps (CFL)
- Car batteries,oil filters,car care products and consumables

- Clause 15(j) of SWM Rules, 2016 ensure safe storage and transportation of the domestic hazardous waste to the hazardous waste disposal facility or as may be directed by the State Pollution Control Board or the Pollution Control Committee.
- All waste generators should be directed by the municipal authority to not mix special waste including domestic hazardous waste with either the wet waste or dry waste, but to store such wastes separately and hand-over to the special waste collection centres, which should be established by the urban local bodies or to collection schemes through retail trade.
- The Rules have further directed ULBs to establish *one domestic hazardous deposition/delivery centre per 20 sq. km.*
- Clause 15(i) of SWM Rules, 2016 establish waste deposition centres for domestic hazardous waste and give direction for waste generators to deposit domestic hazardous wastes at this centre for its safe disposal.

- Such facility shall be established in a city or town in a manner that one centre is set up for the area of twenty square kilometers or part thereof and notify the timings of receiving domestic hazardous waste at such centres.
- However, given that ULBs are of varying sizes, larger ULBs may decide to establish one domestic hazardous deposition site per ward
- Smaller ULBs may choose to place the deposition centre(s) at appropriate locations, such as market places and commercial areas.
- The timings for receiving domestic hazardous waste at such centre should be notified to public, while ULBs should ensure safe handling of such waste as may be directed by the SPCB or PCC from time to time.
- ULBs should establish a minimum of one domestic hazardous deposition centre per ward or per zone, for ease of deposition of the users.
- Manufacturers and suppliers of products resulting in special wastes should be encouraged to develop systems for "take back", treat or recycle such wastes, or send wastes to registered recyclers, as appropriate.

- Having hazardous components, MSW has to be distinguished from hazardous wastes generated by commercial and industrial units, as defined by the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.
- Hazardous wastes should be disposed by the generating unit at the nearest treatment, storage, and disposal facility (TSDF).
- ULBs can also hold other hazardous waste manufacturers accountable, under aforesaid rules.

ENVIRONMENTAL AUDIT

- Environmental Audit process forms a key component of environmental management.
- It evaluates the performance and compliance of an organization with the prescribed environmental standards to assess the harm caused to the environment or a potential to cause environmental harm.
- In India, after an Environmental audit is complete, a statement is released for the financial year ending 31st March each year and it is submitted to the State Pollution Control Board (SPCB) on or prior to 30th September every year.
- In India, the process for environmental audit was first mentioned under the Environment Protection Act, 1986 by the Ministry of Environment of forests on 13th march, 1992.
- As per this act, every person owning an industry or performing an operation or process needs a legal consent and must submit an environmental report or statement.

- It has three components: State Pollution Control Board, Internal Auditor Board and External Auditor.
- The **State Pollution Control Board** ensures effective implementation of the environmental audit effectively.
- An **Internal Auditor** must comply by the standards set by State Pollution Control Board while analyzing air and water samples.
- The **External Auditor** team should be selected by State Pollution Control Board.

OBJECTIVES OF ENVIRONMENTAL AUDIT FOR AN ORGANIZATION

The main objectives of environmental auditing for an organization are:

1. Monitoring existing management practices.
2. Assessing any harm caused to the environment as a result of a process or process design.
3. Evaluating whether the process and activities of the organization comply by the environmental standards set by the local and international governing bodies.
4. Designing and implementing necessary measures or alternatives if necessary.

WHAT ARE THE BENEFITS OF AN ENVIRONMENTAL AUDIT?

- Development of an environmental management plan,
- Evaluation of environmental input and potential risks,
- Implementing necessary improvements,
- Examining if the organization complies with environmental laws and prescribed standards,
- Safeguarding humans and all ecosystems
- Minimizing any environmental problem on a local, regional, national and international level.

CONTAINMENT

- Containment is the retention of hazardous material so as to ensure that it is effectively prevented from dispersing into the environment, or released only at an acceptable level.
- Containment may occur in specially built containment spaces.

REMEDIAL ALTERNATIVES

The process of developing and evaluating remediation alternatives can be divided into steps:
1) Establishment of remedial action objectives.
2) Development of remediation alternatives (scenarios).
3) Screening of alternatives.
4) Detailed analysis of alternatives

Development of remediation alternatives involves definition of general response actions, which are particular approaches to remediation for a contaminant or class of contaminants in one medium; identification of technologies, which involves choosing specific remediation processes for contaminated media; screening of technologies, in which process options or entire technology types are eliminated, principally on the basis of technical implementability; and assembly of technologies into remediation alternatives, which are scenarios for clean up of an entire site or operable unit

Remedial alternatives are evaluated against nine criteria:

(I)short-term effectiveness;
(2) long-term effectiveness;
(3) reduction in toxicity, mobility, or volume;
(4) implementability;
(5) cost;
(6) compliance with applicable or relevant and appropriate requirements (ARARs);
(7) overall protection of human health and the environment;
(8) State acceptance; and
(9) community acceptance

THANK YOU...