GREEN DISPOSAL
(GREEN AND SUSTAINABLE COMPUTING)

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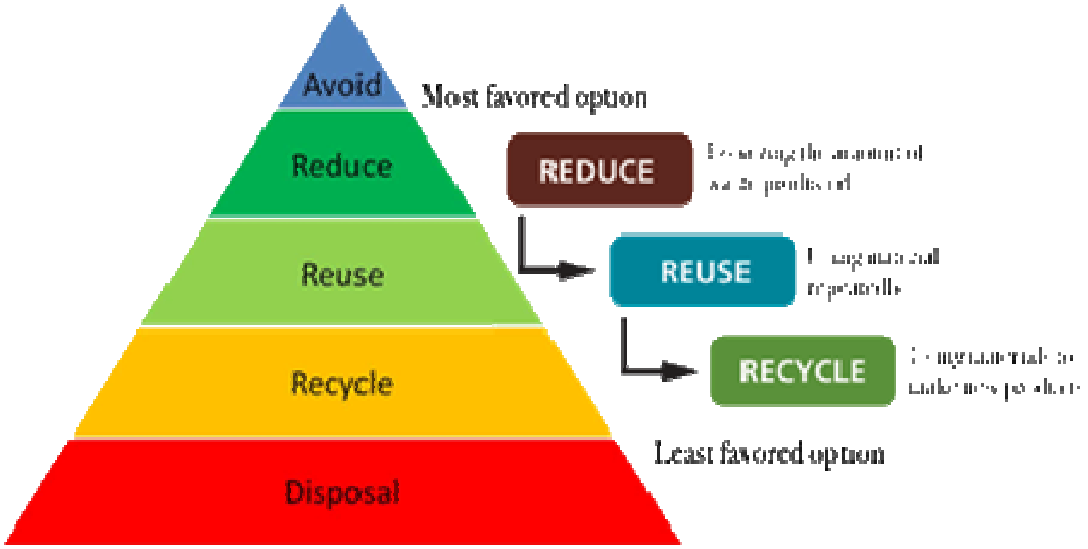
Introduction

1. With the advancement of newer technology , the life of any new product related to technology like TV, Computer, mobile phone etc. is shortening fast. People are buying and dumping the e-gadgets more frequently.

2. This leads to an over accumulation of e-Waste and that requires a proper disposal. Discarded PCs, Laptops, Mobile Phones, Digital Cameras etc. are some of the commonly accumulated e-Waste.

Popular disposal method

- 5 steps to achieve the proper disposal of electronic waste like TV, Computer, Mobile
  - Avoid
  - 3-R
    - Reduce
    - Reuse
    - Recycle
  - Disposal

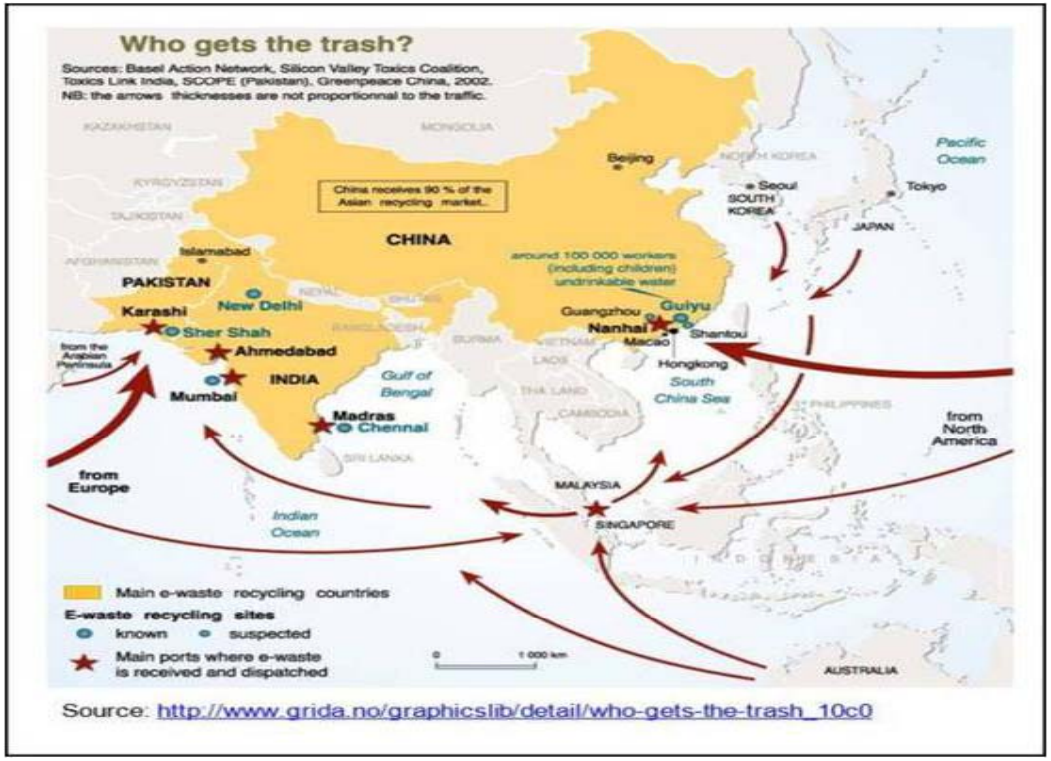


Three routes to E-Waste disposal

- The right route is to process e-Waste through a service that recycles as much of the materials as possible.
- Local landfill
- The worst route is to transfer the equipment to a recycler who ships the stuff to a third-world country.
  - $20 to recycle in Developed country
  - $2 to recycle in Developing / 3rd world countries

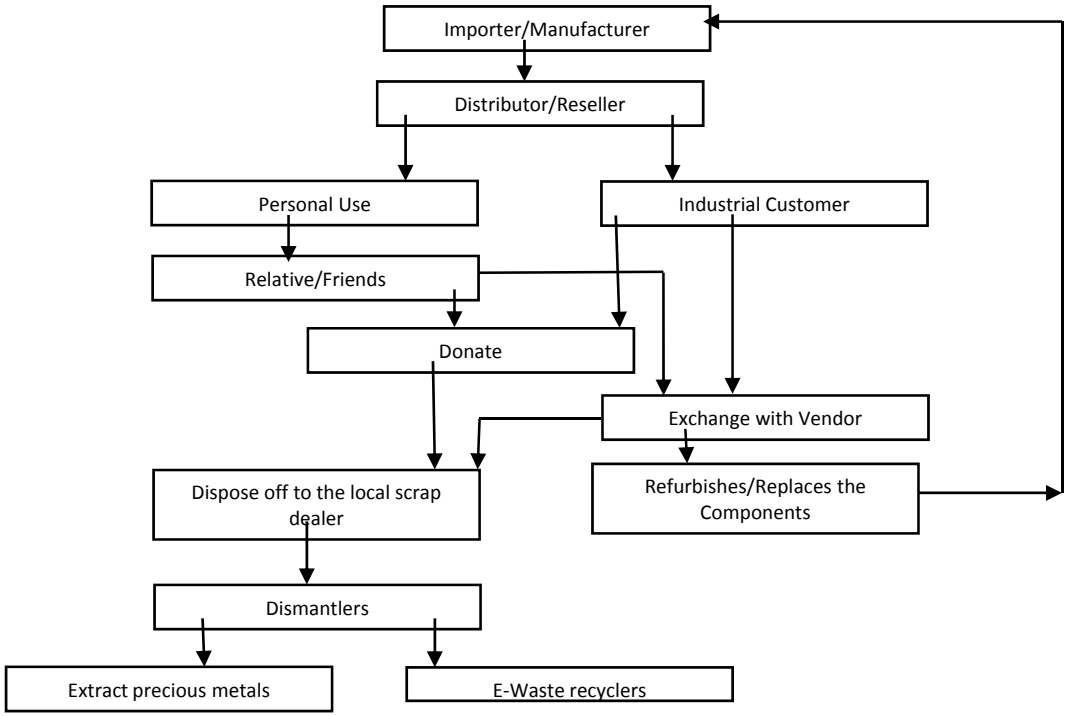
Developing Vs. Developed Country

- Land Refill – Developing country
- Risks and Hazards
  - **Heavy metals:** Lead, Cadmium, Mercury, Barium, Arsenic, Selenium
  - **Precious metals:** Gold, Silver, Platinum
  - **Other metals:** Copper, Aluminum
  - **Chlorinated compounds:** Poly Vinyl Chloride (PVC)
  - **Plastics:** Poly Chlorinated Biphenyls (PCB), Poly Chlorinated Diphenyl Ether (PCDE)



Developed Country

- Importer/Manufacturer
- Distributor/Reseller
- Relative/Friends
- Industrial Customer
- Personal Use
- Donate
- Exchange with Vendor
- Dispose off to the local scrap dealer
- Refurbishes/Replaces the Components
- Dismantlers
- E-Waste recyclers
- Extract precious metals



Popular methods for Extraction , Emission and Harmful effects

- Open burning
  - Copper is recovered after burning PVC/PCBs/PWBs
  - PCDDs and PCDFs emitted are carcinogens which can modify the DNA and cause genetic defects to future generations

Popular methods for Extraction , Emission and Harmful effects

- Land filing and Open dumping
  - A landfill does not help in controlling toxins and its harmful effects
  - Heavy metals can cause damage to the nervous system, the brain, and the kidneys and can cause birth defects and cancer.
  - Toxic water can destroy Flora and Fauna in the rivers and oceans.

Popular methods for Extraction , Emission and Harmful effects

- Toner sweeping by hand
  - Manually sweeping the toner out of printer cartridge without respiratory protection and many times without hand gloves
  - Toner contains Class-A2 carcinogenic carbon black
  - Chances of cancer and respiratory diseases

Popular methods for Extraction , Emission and Harmful effects

- Acid Stripping of PCBs
  - PCBs are dipped in a acid bath
  - Water samples tested around areas of such activities found to contain high level of toxics
  - Water not fit for human consumptions

Non-Green Vs. Green

Non-Green	Green
•CRTs are broken manually to separate its components – glass, metal and copper. •The glass, comprising lead, is sold to bakeries or bangle makers. •The CRTs are re-sold to non-branded television makers.	•Components of the CRTs are separated by heating in a closed chamber, which sucks out Phosphors from the components. •They are then crushed in shredder machines. •Glass containing lead is sold to the companies that manufacture the CRTs.
•Circuit boards have gold plated brass pins, microchips and condensers which are Separated by heating. •Fumes released during heating are toxic. •Gold-plated brass pins are soaked in acid to recover the gold and brass separately. •Microchips and condensers are heated in big containers filled with acid to extract metallic parts.	•Circuit boards are crushed in shredder machines. T •hey are sent to approved smelters abroad, where after smelting at 1200°C, the metals in the circuit board collect together. •Since smelting is carried out in closed chambers at high temperature, it is not hazardous. •The metals—lead, copper, nickel, tin, gold, silver, palladium—are then separated by electro-refining.

Green Disposal Methods

- **Reuse:**
  - Design for longevity which can be achieved by variety of design changes.
- **Recycle:** Use Extended Producer Responsibility (EPR) approach in which the manufacturer takes responsibility of maintenance of the product post product life too.
  - **Producer Responsibility:**
    - A producer can recycle the product, refurbish the product or can dispose of the product.
    - For example, Nokia has established almost more than 1400 bins across India to collect disposed mobile phones and accessories
    - Globally, Nokia has collected more than 1.5 million pieces of phones & accessories weighing over 70 tones.
  - **Bulk Consumer Responsibility:**
    - e-waste is directed to the authorized e-Waste dealers
    - e-Waste can also be directed to the re-furbishers, registered dismantlers or recyclers
    - Bulk consumers are liable to pay a fine if they fail to follow the above process.
  - **Individual Consumers:**
    - Submit the e-Waste or end-o-life electronic products to the dealer
    - Drop it to the authorized collection centers.
    - Producers should pay some minimum price on the returned equipments.
- **Reduce :** Reduce the usage of non-toxic and environmentally friendly raw materials in equipments

Laws and Regulations

The Basel Convention on the Control of the Trans-boundary movement of Hazardous Waste and Their Disposal is the most comprehensive global environmental agreement on hazardous and other wastes.

BASEL CONVENTION

Shortcomings:

USA not part of it.

inspections of 18 European seaports found as much as 47% of waste destined for export, including e-waste, was illegal

Still e-waste is transported to the third-world countries like China, India, Pakistan, Bangladesh and Ghana.

Laws and Regulations

Waste Electrical and Electronic Equipment (WEEE) directives, the producer, re-seller and importer of electronic equipment will have legal obligations with regard to the recycling, reuse and disposal of electronic equipments or components.

Shortcomings:

Product price now decided based on recycling but still cost of recycling is not recoverable by them.

There is need to give subsidies to the manufacturers who are actively involved in the recycling.

Laws and Regulations

In India, The Ministry of Environment and Forests (MoEF) has issued the Guidelines for Environmentally Sound Management of E-Waste.

•Extended Producer Responsibility (EPR)

•Restriction of Hazardous Substances (RoHS)

•Import of used EEE will be prohibited if it is designated for further usage.

Shortcomings:

Lax law enforcement tons of e-waste enters India under the guise of donation

These practices are not caught due to lack of manpower, scanning equipments in ports and also partially due to corruption.

Free Trade Agreements (FTAs) or "Economic Partnership Agreements" (EPAs) are often used to disguise e-waste and developed nation ship the e-Waste to the developing economies.

Conclusion

- Avoid/Minimize
- 3-R
- Green Disposal
- Understanding responsibilities towards society
- Reduce greediness
- Strengthen Laws and its Enforcements

Green Disposal

Q&A

Ref: All images used in this PPT are publically available at Internet