RONGO UNIVERSITY SCHOOL OF INFOCOM; Bsc. Informatics Year 3.1

- **UNIT: Green Computing**

By Ms. Tabitha N

IMPORTANT ABBREVIATIONS TO NOTE

- **Chlorofluorocarbon (CFC)** is a compound consisting of chlorine, fluorine, and carbon. CFCs are commonly used as refrigerants, solvents, and foam blowing agents.
- **Collector** means a person who receives e-waste directly from a residence for recycling or processing for reuse. "Collector" includes, but is not limited to, manufacturers, recyclers, and refurbishers who receive e-waste directly from the public.
- **Electrical equipment** includes any machine powered by electricity. They usually consist of an enclosure, a variety of electrical components, and often a power switch. Examples of these include: major appliance, microcontroller, power tool and small appliances. It also often refers only to the components part of the electrical distribution system such as: Electric switchboards, distribution boards, circuit breakers and disconnects, electricity meter and transformers.
- **Electronic Equipment** is equipment that involves the controlled conduction of electrons (especially in a gas or vacuum or semiconductor) e.g. amplifier, audio and sound system, cassette player, CD player, Cathode Ray Oscilloscope, detector, equalizer, mixer, modem, telephone etc.
- **Environmental Audit (EA)** is a systematic evaluation of activities and processes of an ongoing project to determine how far these activities conform to the Environmental Management Plan of that specific project and sound environmental management practices.

IMPORTANT ABBREVIATIONS TO NOTE

- **Environment Impact Assessment (EIA)** is a systematic examination conducted to determine whether or not an activity or project will have any significant impacts on the environment, provide mitigation for the adverse impacts and optimize the positive impacts.
- **Extended Producer Responsibility (EPR)** is an environment protection strategy that makes the producer responsible for the entire life cycle of the product, especially for take back, recycle and final disposal of the product.
- **E-waste** is a term encompassing various forms of electrical and electronic equipment that are old, end-of-life electronic appliances that have ceased to be of any value to their owners. (definition by UNEP)
- **Hydrochlorofluorocarbon (HCFC)** is a compound consisting of hydrogen, chlorine, fluorine, and carbon. The HCFCs are one class of chemicals being used to replace the CFCs.
- **Polychlorinated biphenyls** (**PCB**s) are a class of organic compounds with 1 to 10 chlorine atoms attached to a molecule composed of two benzene rings. They are widely used for many applications, especially as dielectric fluids in transformers, capacitors, and coolants. They are toxic and are classified as Persistent Organic Pollutants (POPs).
- **Producer Responsibility Organisation (PRO)** is a delegated extended producer responsibility (EPR) by the producer to a third party, which is paid by the producer for spent-product management.

IMPORTANT ABBREVIATIONS TO NOTE

- **Recycler** is a person who engages in treating or processing (of used or waste materials) to make them suitable for reuse.
- **Recycling** is the processing of used materials (waste) into new products to prevent waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage, reduce air pollution and water pollution by reducing the need for "conventional" waste disposal or producing a new product from a recyclable material.
- **Refurbisher** means a person who renovates or processes e-waste for reuse, but does not include telecommunications carriers, telecommunications manufacturers, or commercial mobile service providers with an existing recycling programme.
- **Strategic Environmental Assessment (SEA)** is a system of incorporating environmental considerations into policies, plans and programmes. It is sometimes referred to as Strategic Environmental Impact Assessment.

E-WASTE AND THE ENVIRONMENT

- Since e-waste is a diverse combination of various type of toxic elements, which are capable of creating an irreversible impact to the environment and human health if not handled properly. E-waste is highly complex to handle because of its composition.
- It is made up of multiple components some of which contain toxic substances that have an adverse impact on human health and environment if not handled properly that is if improper recycling and disposal methods are deployed.
- So there is a need for appropriate technology for handling and disposal of these chemicals. Thus, residents living nearby can intake these hazardous chemicals through different exposure pathways. Since the recycling process is done near residential area, population group which is vulnerable to hazardous chemicals, such as infants and children are alike to be affected a lot regarding their health
- Lead is a highly toxic metal with no known useful function in the human body of particular concern is the effect of relatively low-level exposure on cognitive and behavioral development in children, including the lowering of IQ
- 1. Formal electronic waste recycling facilities use specifically designed equipment to safely remove salvageable materials from obsolete electronics while protecting workers from adverse health effects. However, these centers are very expensive to build and run and are rare in less developed countries.

E-WASTE AND THE ENVIRONMENT

- Because of the high levels of environmental, food, and water contamination, residents living within a specific distance of e-waste recycling areas are also at risk of environmental exposure, although at lower levels than through occupational exposure. Persistent organic pollutants are a group of lipophilic, bio accumulative substances that are very resistant to breakdown because of long half-lives.
- Common persistent organic pollutants found in electrical and electronic equipment components include: brominated flame retardants (poly brominated diphenyl ethers), polybrominateddiphenyls, dibrominateddiphenyl ethers, polychlorinated biphenyls, poly chlorinated or poly brominated dioxins and dibenzo furans dioxins, hexabromocyclododecanes, and perfluroalkyls. Persistent organic pollutants released during dismantling, typically from incineration and smelting, include polychlorinated dibenzodioxins, polychlorinated dibenzofurans, and dioxin-like polychlorinated biphenyls. Poly cyclic aromatic hydrocarbons are naturally occurring, hydrophobic substances that are formed during incomplete combustion of coal, gas, oil, meat, tobacco, incense, and wood .These hydrocarbons are formed and released into the environment during the burning of e-waste materials

E-WASTE AND THE ENVIRONMENT

- Americium: The radioactive source in smoke alarms. It is known to be carcinogenic.
- Mercury: Found in fluorescent tubes, tilt switches (mechanical doorbells, thermostats), and flat screen monitors. Health effects include sensory impairment, dermatitis, memory loss, and muscle weakness. Exposure in-utero causes fetal deficits in motor function, attention and verbal domains. Health effects in animals include death, reduced fertility, and slower growth and development.
- Sulphur: Found in lead-acid batteries. Health effects include damages to vital organs such as liver, kidney and heart and also causes eye and throat irritation. When released into the environment, it increases the problem of acid rain.
- BFRs: Used as flame retardants in plastics in most of the electronic devices. Health effects include impaired development of the nervous system, thyroid &liver problems. PBBs were banned from 1973 to 1977. PCBs were banned during the 1980s.
- Cadmium: Found in light-sensitive resistors, corrosion-resistant alloys for marine and aviation environments, and nickel-cadmium batteries. The most common form of cadmium is found in Nickel-cadmium rechargeable batteries. These batteries tend to contain between 6 and 18% cadmium. The sale of Nickel-Cadmium batteries has been banned in the European Union except for medical use. When not properly recycled, it can leach into the soil, harming microorganisms and disrupting the soil ecosystem. The inhalation of cadmium can

E-WASTE AND THE ENVIRONMENT

- Lead: used as a soldering agent and also used in CRT monitor glass, lead-acid batteries etc., Adverse effects of lead exposure include impaired cognitive function, behavioral disturbances, attention deficits, hyperactivity, conduct problems and lower IQ.
- Beryllium oxide: Filler in some thermal interface materials such as thermal grease used on heat sinks for CPUs and power transistors, magnetrons, X-ray-transparent ceramic windows, heat transfer fins in vacuum tubes, and gas lasers.
- Hexavalent chromium: A known carcinogen after occupational inhalation exposure. The above health effects show that precautions have to be taken in handling the e-waste to overcome the health hazards

Effect of Electronic waste on Environmental& Human health

- Disposal of e-wastes is a particular problem faced in many regions across the globe. Computer wastes that are land filled 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.
- 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