

# Business and Economic Potential of Resource Recovery and Recycling from E-waste

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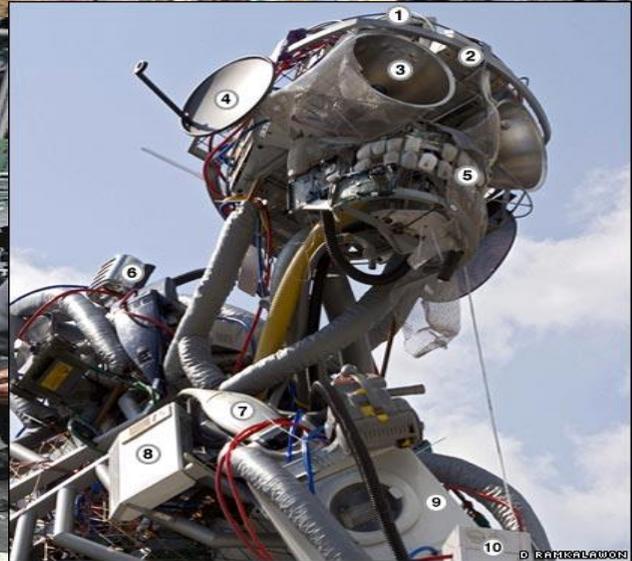
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# Presentation Outline

- Major challenges in e-waste management in Asia-Pacific
- Potential business and economic opportunities in e-waste
- Role of e-waste inventory, Extended Producer Responsibility (EPR), private sector and manufacturers and Public Private Partnerships (PPPs) in transforming e-waste sector into an economic industry
- Role of Research & Development (R&D) and technology transfer as key driver for harnessing economic potential for e-waste sector
- The way forward

# E-waste



# What is E-waste?

- Temperature exchange equipment (refrigerators, freezers, air conditioners, heat pumps).
- Screens, monitors (televvisions, monitors, laptops, notebooks, and tablets).
- Lamps (fluorescent lamps, compact fluorescent lamps, high intensity discharge lamps and LED lamps).
- Large equipment (washing machines, clothes dryers, dish washing machines, electric stoves, large printing machines, copying equipment and photovoltaic panels).
- Small equipment (vacuum cleaners, microwaves, toasters, electric kettles, electric shavers, scales, calculators, radio sets, video cameras, electrical and electronic toys, small electrical and electronic tools, small medical devices, small monitoring and control instruments).
- Small IT and telecommunication equipment (mobile phones, GPS, pocket calculators, routers, personal computers, printers, telephones).

# Global E-waste Generation

- During 2014 world generated around 41.8 million tonnes (Mt) of E-waste
- Global e-waste generation to reach 50 Mt by 2018 (annual growth rate of 4 to 5%)
- Asian region produced the highest amount of e-waste (16 Mt or 38% of total), followed by Americas (11.7 Mt) and Europe (11.6 Mt).
- The top three Asia-Pacific countries with the highest e-waste generation in absolute quantities are PR China (6 Mt), Japan (2.2Mt) and India (1.7Mt).
- Source: Global E-waste Monitor 2014 (UNU)

# Problems Associated with E-waste

- Dangerous chemicals and metals from e-waste may leach into the environment
- Lead (Pb) - most significant concern
- Lead present in the solders used to make electrical connections on printed wire boards and Cathode Ray Tubes (CRTs)
- Mercury found in laptop computers and discharge lamps.
- Cadmium (found in chip resistors, CRTs)
- Brominated Flame Retardants (BFRs)



# Opportunities Associated with E-waste

- One tonne of phone handsets contains 3.5kg of Ag, 340 g Au, 140g of Pd and 130 kg of Cu
- Electronics make up 80% of the world demand for indium (magnetic properties in hard disks), 50% of antimony (flame retardants), 30% of silver (contact, solders), 12% of gold (circuits)
- E-waste generated globally in 2007 from mobile phones and computers alone would have contributed to 3% of the world mine supply of gold and silver, to 13% of palladium and 15% of cobalt.
- Gold content of total e-waste generated in 2014 is roughly 300 tonnes, which represents 11% of the global gold production from mines in 2013.

Source: UNEP and UNU

# Resource Recovery from E-waste



- 1 million cell phones can recover 24kg of gold, 250kg of silver, 9kg of palladium and 9000kg of copper
- 1 tonne (t) of e-waste from personal computers contains more gold that can be recovered from 17 t of gold ore
- 1 tonne of used mobile phones (about 6000 handsets) contains 3.5kg of silver, 340grams of gold, 140grams of palladium and 130 kg of copper - worth US\$15,000!!!

Source: Electronics Takeback Coalition

# Issues and Challenges of ESM of E-waste

- Increasing volume of e-waste imported illegally into developing countries
- Accessing funds and investment to finance proper e-waste recycling facilities
- Developing appropriate policies and legislation specifically to deal with e-waste
- Implementing mandatory or effective voluntary take-back schemes, such as EPR
- Ability to gather data and inventory on e-waste generation including transboundary movements
- Establishment of proper infrastructure for e-waste collection, transportation, storage, treatment, recovery and disposal
- Improving the working conditions and minimisation of work-related hazardous exposure at e-waste management facilities
- Raising awareness of health and environmental impacts of e-waste
- Development of public-private partnerships to implement e-waste resource recovery and recycling operations

# Issues related to Resource Recovery and Recycling of E-waste

- Only a fraction of e-waste is currently recycled in even in developed countries.
- End-of-life EEE does not reach the recycling process as part of the EEE is stored at home
- Only a part of collected e-waste is sent directly to recycling for environmentally sound recovery of materials
- Remainder is reused and then recycled or exported for reuse in developing countries
- Rudimentary recycling processes employed in developing and transition economies achieve far less recovery yields especially with valuable metals.
- advanced integrated smelter could recover over 95% of the gold, recycling practices in developing countries could achieve only around 25%.



# Successful Business Models



### A. Community Public

1. To promote household waste sorting
2. To encourage community organizations to promote recycling activities

### D. Recycling Fund

1. To be paid by responsible enterprises
2. To subsidize the recycling and disposal system

Source of Waste

Private Sector's Recycling, Clearance and Disposal System



### B. Recycling Enterprises

1. To encourage the development of private sector
2. To purchase waste resources from the public, communities and cleaning teams

### C. Local Authority (Cleaning Teams)

1. To collect, clear and transport resource waste, food waste and general waste separately
2. Creating a feedback system to encourage people and communities joining the recycling work

To be paid by article or container manufactures, importers and vendors

The Government's Recycling, Clearance and Disposal System

# Key Contributors to Resource Recovery and Recycling of E-waste

- E-waste Inventory
- Private Sector (EEE manufacturers and recyclers)
- Public Sector (national and local governments)
- Public Private Partnerships (PPPs)
- Extended Producer Responsibility (EPR)
- Research & Development (R&D)
- Technology Transfer

# Enabling Factors for PPPs in E-waste

- Regulation should create incentives for voluntary environmental improvements
- Environmental regulation should be fair and reasonable
- Manufacturers and importers should be given the option of treating the collected wastes in their overseas contracted treatment facilities
- Legislation should support and advocate the EPR as an environmental policy approach to manage post-consumer e-wastes
- Obligations for manufacturers and importers should be based on the actual e-waste arising model, as opposed to products put on market or import volumes or sales of previous year.

# Examples of PPPs in E-waste

- IPLA - International Partnership for Expanding Waste Management Services of Local Authorities
- StEP - Solving the E-waste Problem
- PACE - Basel Convention Partnership for Action on Computing Equipment
- MPPI - Basel Convention Mobile Phone Partnership Initiative
- SAEWA - South African E-waste Alliance
- E-waste Alam Alliance Malaysia



E-waste Alam Alliance - Asia

From Penang to whole Malaysia and to other Asian countries



# Extended Producer Responsibility (EPR)

EPR schemes make producers physically or financially responsible for the environmental impacts of their products throughout their life cycle.

EPR Categories include:

- Product take-back schemes that require the producer or retailer to collect the product at the post-consumer stage.
- Economic and market-based instruments that include measures such as deposit-refund schemes, Advanced Disposal Fees (ADF)
- Regulations and performance standards
- Information-based instruments



# Research & Development

- The traditional manufacturing process in the electronics industry has been linear in nature which can be regarded as 'take-make and waste'
- A product is like a messenger between the acts of production and consumption. They are the carriers of material's flow, energy usage, functional performance and environmental impacts.
- The challenge is to ensure that an integrated circular whole systems design encouraging a 'borrow-use-return' approach



# Technology Transfer

Key components of E-waste resource recovery and recycling chain:

- Treat the hazardous compounds contained in e-waste in an environmentally sound manner
- Recover valuable material using efficient processes
- Create economically and environmentally sustainable businesses
- Consider social impact and local context of operations



# Way Forward

- E-waste inventory
- Policy and Strategy framework for sustainable management of e-waste (where we are now? Where we want to be? How we get there?)
- Create enabling conditions for relevant stakeholders to develop business and economic opportunities to recover the materials from e-waste.
- How relevant is EPR as a policy tool ? If relevant what are the issues and challenges?
- Developing standards for collection, storage, transport, recovery, treatment and disposal to ensure environmentally sound management of e-waste

# Way Forward

- Does the existing legal and institutional framework achieve true potential of business and economic opportunities towards resource recovery and recycling of e-waste?
- What are the enabling factors to promote resource recovery and recycling of e-waste in the areas of; a) Market potential, b) Engagement of private sector and manufacturers, c) Developing PPPs, and d) Technology transfer?
- Do existing financial arrangements for managing e-waste achieve financial sustainability? If not, what are the suitable financial mechanisms (eg. EPR) that are suitable for Asia-Pacific countries?

**Thank You!**