Environmentally Sound Management of E-waste: Emerging Issues, Challenges and Opportunities for Material Recovery and Recycling

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Presentation Outline

- What is E-waste and problems associated with it
- International Laws, Regulations and Initiatives
- End-of-Life Management
- Upstream Reduction of E-waste
- ESM of E-waste in Asia
- Case Study from Australia
- Developing E-waste research Partnerships
- Conclusions

WHAT IS E-WASTE? (anything that has a battery or a power plug)

- Computers
- Monitors
- Keyboards
- Photocopiers
- Televisions
- VCRs
- Fax Machines

- Mobile Phones
- Video Cameras
- Stereos
- Microwave Ovens
- Washing Machines
- Dishwashers
- Digital Cameras

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E-Waste Facts

- Every year 20 to 50 million tonnes of e-waste are generated worldwide
- E-waste is currently growing at around 4% per year
- E-waste accounts for 8% of all municipal waste in Europe
- In China about 20 million electronic household appliances including TV, washing machines, PCs etc) and 70 million cell phones reach end-of-life every year

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E-waste Facts

- E-waste contains more than 1000 different substances, many of which are toxic
- About 70% of the heavy metals (mercury and cadmium) in US landfills come from electronic waste and 40% lead in landfills come from electrical and electronic equipment
- 22% of the yearly world consumption of mercury is used in electronics manufacture

E-waste (Computers)

- 500 million computers became obsolete in the US between 1997 and 2007
- In 2007, 271 millions computers were sold worldwide
- One billion PCs will be in use by the end of 2008 - two billion by 2015 with most growth in emerging Brazil, Russia, India, and China
- Life span of a computer changed from 4-6 years in 1997 to 2 years in 2005 and further decreasing
- Manufacturing a computer and its screen takes at least 240kg of fossil fuels, 22 kg of chemicals and 1.5 tonnes of water – more than the weight of a car

E-waste (Mobile Phones)

- Average working life of a mobile phone is 7 years but worldwide the average consumer changes their mobile every 11 months

- Over one billion mobile phone handsets were in use around the world in 2006

- Each year 130 million mobile phones in the US and 105 million mobile phones in Europe will be thrown away

- 700 million obsolete phones discarded in 2005 contained an estimated 560,000 kg of lead in the form of solder

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TOXICS IN E-WASTE

- Chemicals in e-waste may leach into the environment
- This includes variety of metals and dangerous chemicals
- Computer equipment contains over 1000 materials

TOXICS IN E-WASTE
Lead

- Most significant concern
- Present in the solder used
  to make electrical connections on printed wire boards
- Found in Cathode Ray Tubes (CRTs)
- Over 40% of Lead found in landfills comes from e-waste

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TOXICS IN E-WASTE

- Mercury (found in laptop computers and discharge lamps. 22% of yearly world consumption used in electronics)

- Cadmium (found in chip resistors, CRTs)

- Brominated Flame Retardants (BFRs)

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BROMINATED FLAME RETARDANTS

- Housing   59%
- Printed Wire Boards   30%
- Connectors & Relays   9%
- Wire and Cabling   2%

Polybrominated Diphenylethers (PBDE)

International Laws, Regulations and Initiatives

- Waste Electrical and Electronic Equipment (WEEE) Directive
- Restriction of Hazardous Substances (RoHS) Directive
- EU Directive on Energy-using-Products (EuP)
- EU Directive on Registration, Evaluation and Authorisation of Chemicals (REACH)
- E-waste regulations in Japan, China, India, Korea, United States, Canada
- Basel Convention
- Basel Convention Partnership on the ESM of E-waste in the Asia-Pacific region.
- StEP Initiative
- Regional 3R Forum in Asia

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End-of-Life Management of E-waste

- **Reuse:** the recovery and trade of used products or their components as originally designed;

- **Servicing:** a strategy aimed at extending the usage stage of a product by repair or maintenance;

- **Remanufacturing:** the process of removing specific parts of the waste product for further reuse in new products;

- **Recycling:** Recycling can be done with or without disassembly, including the treatment, recovery, and reprocessing of materials contained in the used products or components in order to replace the virgin materials in the production of new goods;

- **Disposal:** the processes of incineration with or without energy recovery or landfill.

E-WASTE IN CHINA

E-WASTE IN INDIA

E-WASTE IN AFRICA

EXTENDED PRODUCER RESPONSIBILITY (EPR)

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

- Includes upstream and downstream impacts

NEW TECHNOLOGIES
Green Design & Purchasing

- Environmental issues become part of the design process (Cleaner Production)

- Reduced use of toxins during production

- Finding new materials and technologies

- Purchasing upgradeable equipment

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NEW TECHNOLOGIES
Reduce use of Toxins

- New Lead free solders
- Alternatives to brominated flame retardants
- LCD displays without mercury backlighting

ESM of E-waste in Asia

- An appropriate legislative framework;
- Sustainable development policies, including policies on the collection, recycling and recovery of electronic and electrical wastes and ones that address the transboundary movements of such wastes;
- Economic incentives for environmentally sound practices and technologies;
- Green design aimed at reducing the use of hazardous materials in electrical and electronic products and enhancing their recyclability;
- Closing the loop for recyclables;
- Extending the life of products through reuse, refurbishment or repair;
- Elimination of hazardous constituents in products;
- Worldwide environmentally sound management standards or criteria for recycling and final disposal of electronic wastes;
- Action to prevent illegal traffic;
- Broad public awareness;
- Public-private partnerships to engage all stakeholders;
- Regional level playing field on how to deal with export and import of electronic and electrical wastes.

Source: Basel Convention

Challenges for ESM of E-waste

- Regulatory instruments to address the ever increasing import of e-waste into Asian countries from other parts of the world;
- 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;
- Adoption of green product design practices by equipment manufacturers;
- Development of pool of experts and resources to deal with the e-waste issues;
- Development of public-private partnerships involving all the stakeholders.

Electrical and Electronic Equipment (EEE) in Australia

- Australia's ICT Market is 12th largest in the world.

- ICT contribution to GDP is 4th highest in the world.

- 85% of businesses use a computer and 71% have Internet access.

- 70% households have access to a computer and 60% have Internet access.

- On average 22 EEE in Australian homes

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E-Waste in Australia

- Total Environment Centre estimates by end of 2008 Australia's E-waste count was 168 million items which include 37 million PCs and 56 million Mobiles.
- 31.7 million new televisions and computers sold in 2007/08
- 16.8 million televisions and computers reached their end of life (EOL) in 2007/08
- 88% sent to landfill and only 9% recycled
- 44 million televisions and computers to reach EOL by 2027/28
- 5.3 million already in storage
- 21.1 million mobile phones at the end 2006-07, greater than the Australian population

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END OF LIFE MANAGEMENT

- Reuse/Donation (within organisation, local schools, charities)

- Recycling (manufacture take-back, local govt collection schemes, recycling contacts)

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Federal Government Initiatives

EPHC's Consultation Regulatory Impact Statement proposes number of options:

- Business as usual
- Co-regulatory State-based EPR scheme
- Co-regulatory Commonwealth-based EPR scheme
- Co-regulatory Commonwealth Levy
- Mandatory Commonwealth levy with government run subsidy scheme
- Mandatory import license requirement
- Mandatory State-based EPR

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State Government Initiatives

- Victoria's Byteback program – free computer collection & recycling
- NSW Sustainability Compact
- ACT E-waste landfill ban
- SA discussion paper to ban E-waste from landfill
- Initiatives by number of LGs (pilot in Gold Coast)

Industry Initiatives

- Australian Information Industry Association (AIIA)

- Various producer recycling schemes (DELL, HP, Apple)

- Australian Mobile Telecom Association(AMTA) MobileMuster program

E-Waste Research Group

- Member of StEP
- Australia's only e-Waste website (www.griffith.edu.au/ewaste)
- HP funding for on-going research
- Dell funding for take-back day
- Development of 'Circuits in Plastics'
- Series of stakeholder surveys
- Developing best practice in campuses
- Postgraduate research students

Griffith University Take-Back Day

e·waste 2010

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Welcome

The E-Waste Research Program of Griffith University's Atmospheric Environment Research Centre, in conjunction with the Solving the E-waste Problem (StEP) Initiative founded by various United Nations organisations, will hold the first major International Conference on e-waste in the Southern Hemisphere in Brisbane in July 2010.

This conference and workshop will bring together for the first time all the important regional stakeholders in e-waste to collaborate on the development of research, policies and management strategies to direct the future of electronics and e-waste in the Asia-Pacific Region region.

The conference themes will include:
* Policy and Legislation
* ReDesign
* ReUse
* ReCycle

A major objective of the conference will be to enhance capacity building of e-waste management in the region and develop recommendations for a regional strategy.

For further information, or to register your interest, please contact Jo Smith at
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Griffith UNIVERSITY   **StEP** SOLVING THE E-WASTE PROBLEM   UNITED NATIONS UNIVERSITY   UNEP United Nations Environment Programme

Proposed E-waste Research Partnership under 3R Forum

- Collaborative Partnership for Research in Technology, Policy Development and Education for ESM of E-waste in the Region
- Share Innovations, Ideas and Information on Best Practice and Effective Policy Instruments
- Identify Knowledge Gaps and Undertake Original Research
- Open to all Institutions/Organisations

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Conclusions

- E-waste generated at a higher rate than other waste streams
- Policies and regulations are being developed
- Number of issues with transboundary movement of e-waste
- Several challenges for ESM of e-waste in Asia
- Harmonisation of current activities needed
- Develop a regional e-waste research partnership under 3R Forum