ILLINOIS DEPARTMENT OF COMMERCE AND ECONOMIC OPPORTUNITY

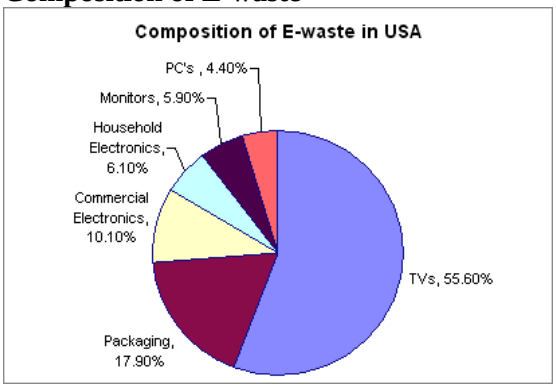
ELECTRONICS RECYCLING
Economic Opportunities and Environmental Impacts

E-waste is old, obsolete, unwanted and end-of-life electronics discards. This includes computer equipment, televisions, photocopiers, facsimile machines, telephones, and other audio and visual related electronic devices. It does not include household appliances.

Generation

E-waste is generally recognized as one of the fastest growing components of municipal solid waste. It was estimated that in 2000, the U.S. generated 2,124,400[(1)] tons of E-waste. This number is only expected to increase as technological advances are made. For example the average life span of a personal computer has shrunk from four or five years to less than 2 years.[(2)] In the year 2002, the world's one-billionth personal computer came off the assembly line.[(3)]

Composition of E-waste



Landfilling

The most common method of managing E-waste has been landfilling. While the weight represented by used electronics is not dramatic, the volume that these items represent in landfills is proportionally more significant because of the bulk and rigidity of these materials.

Furthermore, as some electronic items contain hazardous material, the proper management of those items is important. In addition, electronic items are made with valuable materials that are a great source of recoverable commodities including steel, glass, plastic, and precious metals.

E-cycling

Opportunities to recycle E-waste are increasing in Illinois. DCEO maintains a list of entities that offer E-cycling options. DCEO may also have grant funds available to assist projects that will advance E-cycling. Information regarding these opportunities can be found at "***www.illinoisrecycles.com.***"

Economic Opportunities

An additional area of interest regarding the reuse and recycling of electronic waste is its potential to cycle useful commodities back into commerce, to create jobs and to bring about economic development.

1) Job Creation

In the U.S., repairing electronics can create 200 times as many jobs as landfilling. These jobs correlate to direct and indirect economic growth through payroll, taxes, and consumer spending.

In addition, by salvaging materials for reuse, it helps to close the digital divide by providing the opportunity for low income students and families to obtain low-cost working computers.

So, the traditional waste hierarchy of "reduce, reuse, and recycle" can become the "economic development potential hierarchy" with a slight change: "reduce, reuse, repair, recycle."

For every 1,000 tons of electronics:

- **Landfilled** less than 1 job is created
- **Recycled** 15 jobs are created
- **Repaired** 200 jobs are created

2) Strong Demand

According to a March 2005 report by Business Communications Company, Inc. (BCCI), the market for E-waste will experience major growth over the next several years, for several reasons, including:

- the high cost of oil will increase demand for recycled plastic (10.2% annual increase per year)
- an expected 8.1% growth in metals mined from end-of-life electronic waste that will continue to outpace the broader recycled metals market
- CRT glass-to-glass recycling will experience a 7.5% annual growth

3) Reselling and Upgrading

E-waste recyclers may need to charge a nominal fee for their recycling services. Upgrading an existing computer can save 5 to 20 times more energy than purchasing a new one. With 80% of life cycle energy use associated with manufacturing, this suggests that extension of life span is a key strategy in managing the environmental impacts associated with computers. Another way to state this is that for computers the conventional 3R (reduce, reuse, recycle) hierarchy of waste management is tilted even more towards reduce and reuse compared to most other goods.[(3)]

Environmental Impacts

A few of the reasons why the management of E-waste has drawn national attention are:

1) Wasted Resources

In 2004, experts estimated that 315 million computers became obsolete in the US, many of which will be destined for landfills, incinerators or hazardous waste exports. This will add up to:

- 4 billion pounds of plastic present in computer waste based on average of 13.8 pounds of plastics per computer.
- One metric ton of electronic scrap from personal computers contains more gold than that recovered from 17 metric tons of gold ore.[4]
- In 1998, the amount of gold recovered from electronic scrap in the U.S. was equivalent to that recovered from more than 2 millions metric tons of gold ore.[4]

2) Energy Consumption

- The manufacturing of a desktop computer requires four times the amount of energy than it uses during its lifetime.[3]
- The average desktop computer and monitor require 10 times their weight in fossil fuels and chemicals to manufacture.[3] The manufacturing of a desktop system uses the weight of a sports utility vehicle in materials before it even leaves the factory.
- The total amount of fossil fuels required to make a desk top computer with a CRT monitor is 528 pounds (or 6400 mega joules of energy). The amounts of chemicals used, many which are toxic, are approximately 10 pounds and the amount of water is 3,300 pounds.[3]
- To manufacture a 32MB memory chip requires 3.74 pounds of fossil fuel and chemicals for its production and use phases. In addition, it requires 70 pounds of water per chip.[3]
- Manufacturing computer chips is much more energy intensive than traditional products. The ratio of production inputs to the weight of the final product is 630 for a memory chip, but only about 2 for an automobile or 4 to 5 for an aluminum can.[3]

3) Greenhouse Gas Emissions

The reuse of 1,045 tons of whole unit computers represents more than 1 trillion British Thermal Units (BTUs) saved in one year. This is equivalent to annual savings of:[5]

- 172,474 barrels of oil
- 7.2 million gallons of gasoline
- 14,393 fewer cars on the road
- 71,967 tons in CO_2 emissions

4) Pollution and Toxins in the Solid Waste Stream

The estimated 315 million computers destined for landfills, incinerators or hazardous waste exports in 2004 will generate up to:

- 1.2 billion pounds of lead contained in computer monitors and soldering of printed circuit boards.[6]
- 2 million pounds of cadmium contained in chip resistors, infrared detectors and semiconductors.[6]
- 400,000 pounds of mercury contained in batteries, switches/housing, and printed circuit wiring boards.[6]
- 1.2 million pounds of hexavalent chromium used as a corrosion protection of untreated and galvanized steel plates and as a decorative hardener for steel housing.[6]
- 350 million pounds of brominated flame retardants present in the monitors.[7]

References:

[1] Municipal Solid Waste in the United States: 2000 facts and figures. USEPA Office of and Emergency Response. June 2002, Pages 150-160

[2] http://www.cawrecycles.org/Ewaste/background%20E-waste.html

[3] William E, Sasaki T (2003) Strategizing the End-of-life Handling of Personal Computers: Resell, Upgrade, Recycle in R. Kuehr and E. Williams (eds.) "Computers and the Environment: Understanding and Managing their Impacts", Kluwer, Dordrecht.

[4] Obsolete Computers, "Gold Mine," or High-Tech Trash? Resource Recovery from Recycling, USGS Fact Sheet FS-060-01, July 2001.

[5] Used Electronics Market Study, Northeast Recycling Council, Inc. (NERC)

[6] Explanatory Memorandum, WEEE (Third draft) July 1999, Brussels (05/07/1999).

[7] LCA Study of product group personal computers in the European Union Ecolabel Scheme , 1998