

Electronic Waste (E-waste) Recycling Facts

As we become more dependent on electronic products to make life more convenient, the stockpile of used, obsolete products grows. Although used electronics represent less than two percent of the municipal solid waste stream, if we continue to replace old or outdated electronic equipment at our current rate, that percentage will continue to grow.



In 2005, used or unwanted electronics amounted to approximately 1.9 to 2.2 million tons. Of that, about 1.5 to 1.9 million tons were primarily discarded in landfills, and only 345,000 to 379,000 tons were recycled.

Computer monitors and older TV picture tubes contain an average of four pounds of lead and require special handling at the end of their lives. In addition to lead, electronics can contain chromium, cadmium, mercury, beryllium, nickel, zinc, and brominated flame retardants. When electronics are not disposed of or recycled properly, these toxic materials can present problems. Extending the life of your electronics or donating your most up-to-date and working electronics can save you money and saves valuable resources. Safely recycling outdated electronics can promote the safe management of hazardous components and supports the recovery and reuse of valuable materials.

General Information on E-Waste

How much e-waste is in the waste stream?

Used consumer electronics represent less than two percent of the municipal solid waste stream. In 2005, discarded tv's, pc's, peripherals (including printers, scanners, faxes), mice, keyboards and cell phones totaled about 2 million tons. Of that, about 80-85% (1.5 to 1.9 million tons) was discarded, primarily in landfills.

How much e-waste is recycled?

In 2005, discarded tv's, pc's, peripherals (including printers, scanners, faxes), mice, keyboards and cell phones were recycled at a rate of about 15-20 percent (345,000 to 379,000 tons). The recycled/disposed split remained fairly constant between 1999-2005. Although recycling continues to increase, the percentage recycled remains constant because of the ever-increasing number of electronics available for end of life management.

How many consumer electronics are still in use or storage, of those sold since 1980?

Almost half (or 976 million units) of products sold between 1980 and 2004 are still in use or reuse. Nine percent (180 million units) of products sold between 1980 and 2004 are still in storage.

How much e-waste is exported?

To date, we have only examined export of CRTs. In 2005, approximately 61 percent (about 107,500 tons) of CRT monitors and TVs collected for recycling were exported for remanufacture or refurbishment. The next largest portion, about 14 percent (or 24,000 tons) was CRT glass sold to markets abroad for glass-to-glass processing.

What are the substances of potential concern in electronics?

Lead, mercury, cadmium and brominated flame retardants are among the substances of concern in electronics. These substances are included in the products for important performance characteristics, but can cause problems if the products are not properly managed at end of life.

Lead is used in glass in TV and PC cathode ray tubes as well as solder and interconnects; older CRTs typically contain on average 4 lbs of lead (sometimes as much as 7 lbs in older CRTs), while newer CRTs contain closer to 2 lbs of lead.

Mercury is used in small amount in bulbs to light flat panel computer monitors and notebooks.

Brominated flame retardants are widely used in plastic cases and cables for fire retardancy; the more problematic ones have been phased out of newer products but remain in older products.

Cadmium was widely used in ni-cad rechargeable batteries for laptops and other portables. Newer batteries (nickel-metal hydride and lithium ion) do not contain cadmium.

PVC is used in wire and cable sheathing.

Are cell phones that are collected for reuse or recycling going to be managed in a safe way?

Most cell phones that are collected in the US go either to a charitable organization for reuse or to a relatively small number of US companies who refurbish them for reuse and recycle those that cannot be reused. Although there is some market for used cell phones in the US (such as domestic abuse programs), the principal markets for used and refurbished cell phones are in Latin America and South America. The marketing of used cell phones in these developing economies avails many people the access to modern communication technology who would not otherwise be able to afford it. In nearly all cases, collected cell phones that are obsolete or irreparable are sent to environmentally sound smelters in Canada or Europe for recovery of copper and precious metals.

What products can be made from the materials recovered by recycling cell phones?

Almost all of the materials used to manufacture a cell phone can be recovered to make new products. Metals, plastics, batteries and the packaging materials can be recycled and turned into new products.

Cell phones contain a number of different metals - gold, silver, platinum, palladium, rhodium, copper, tin, lead, brass and zinc - that can be extracted and recovered in the recycling process. The recovered metals can be used by a number of different industries such as jewelry, plating, electronics, plumbing, automotive, and art foundries. Products that can be manufactured from the recovered materials include automotive catalytic converters, plumbing faucets and piping, and gold or silver jewelry.

The plastic on the cell phone can also be recycled. It can be recycled into new products as garden furniture, license plate frames, non-food containers and replacement automotive parts. Due to its high thermal value, the plastic could alternatively be used as a fuel.

The cell phone packaging materials can also be recycled and made as a component of fiber board manufacture. When the rechargeable battery can no longer be reused, the battery can be recycled into other rechargeable battery products.

Benefits of Reuse/Recycling

What are the environmental benefits of reusing and recycling e-waste?

Electronic products are made from valuable resources, such as precious and other metals, plastics, and glass, all of which require energy to mine and manufacture them. Reusing and recycling these materials from end-of-life electronics conserves our natural resources and avoids air and water pollution, as well as greenhouse gas emissions that are caused by manufacturing new products.

What environmental benefits do we get from recycling cell phones?

Recycling your cell phone helps protect the environment in a number of ways. Cell phones are made from valuable resources such as precious metals, copper, and plastics—all of which require energy to mine and process. Recovering these materials by recycling avoids the need to mine and process new materials, which in turn, conserves our natural resources, and avoids air and water pollution and greenhouse gas emissions. For example, if the 100 million cell phones ready for end of life management in 2006 had been recycled¹, we would have saved enough energy to power approximately 194,000² US households with electricity for one year.

How does recycling cell phones reduce mining of metals?

Cell phones have a number of different metals in them which can be recycled – copper, gold, silver, and palladium. Take gold, for example. If we recycled 100 million cell phones, 3.4 metric tons of gold could be recovered³ - allowing that amount of gold to enter back into production without being mined. Because the mining and processing steps were avoided, 5.5 million tons⁴ of loose soil, sand, and rock would not have to be moved and large quantities of waste also would be avoided. Another result is that substantially less fuel would be used, dramatically reducing the emissions of greenhouse gases.

Similar calculations could be made for the other metals used in the manufacture of cell phones. 100 million cell phones contain 1600 metric tons of copper, 35 metric tons of silver, and 1.5 metric tons of palladium⁵.

¹ US EPA Management of Electronic Waste in the United States (April 2007)

² Electronics Environmental Benefits Calculator

³ US Geological Survey "Recycled Cell Phones - A Treasure Trove of Valuable Metals" (July 2006)

⁴ 1 metric ton is equivalent to 32,150.7 troy ounces; 4.5 metric tons of gold equals 144,678.15 troy ounces. Assuming there is 0.02 troy ounces per ton of rock, it will take 50 tons of rock to produce 1 ounce of gold. To calculate the total tons of rock mined to produce 144,678.15 troy ounces you multiply 144,678.15 x 50 = 7,233,907 tons.

⁵ US Geological Survey "Recycled Cell Phones - A Treasure Trove of Valuable Metals" (July 2006)

Source: United States Environmental Protection Agency