Sustainable Cities – Urban Mines

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Challenges

- Volumes
  - Increasing sales of EEE, decreasing lifetimes
- Material Content
  - Valuable and energy-intensive precious metals
  - Toxic materials
A Chinese child sits amongst a pile of wires and e-waste. Children can often be found dismantling e-waste containing many hazardous chemicals known to be potentially very damaging to children's health.
A migrant worker strips plastic from wires to extract useful metals. The plastic on the wires is often PVC which contains toxic chemicals and produces large amounts of pollution when disposed, often by burning in the open air.
Close up of a huge pile of computer keyboards waiting to be scrapped. These are likely to have been thrown away in Europe, US or Japan and then dumped in China because it is cheaper to dump this hazardous waste in China than dispose of it properly.
Chinese man smelts computer parts in the open air to extract metals. Open air burning of computer waste releases large amounts of toxic fumes.
Chinese woman smelts computer circuit boards over an open stove to extract metals. The fan is vain attempt to disperse the highly toxic fumes created by the smelting.
Chinese women dismantle computer circuit boards in an e-waste scrap yard. After sorting the circuit boards they will be burned over open fires to extract metals. The smelting releases large amounts of poisonous gases.
Owner of an e-waste scrapping yard stands in front of a mountainous pile of computer waste waiting to be scrapped to recover useful plastics and metals.
Piles of cables and computer waste awaiting scrapping.
Piles of circuit boards from hazardous computer waste stretch into the distance near an e-waste scrap yard. The circuit boards will be smelted by hand to extract metals. Smelting releases highly poisonous gases and pollutes the environment.
Truck overloaded with hazardous computer waste on the way to scrapping yards.
A boy winces at the smoke rising from the computer motherboards being melted over open fires in electronics waste recycling yard in Delhi.
A worker in a electronics waste recycling yard in Delhi.
Damaged CRT monitors dumped in a swamp area nearby a village in Thailand.
Environmental & occupational safety problems

Ramifications:

- Toxic emissions from burning
- Soil & water contamination from chemical disposal
- Inefficient recovery of precious metals
<table>
<thead>
<tr>
<th>Material</th>
<th>Occurrence in E-waste</th>
<th>Health and Environmental Impact</th>
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<tbody>
<tr>
<td>Beryllium (OECD 2003, Taylor et al. 2003)</td>
<td>copper-beryllium alloys, springs, relays and connections;</td>
<td>• beryllium sensitization/chronic beryllium disease</td>
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<td></td>
<td>• <strong>human carcinogens</strong></td>
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<td>• released as beryllium oxide dust or fume during high temperature metal processing</td>
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<td>Cadmium</td>
<td>Contacts, switches, nickel-cadmium (Ni-Cd) batteries, printer inks and toners</td>
<td>• persistent and mobile in aquatic environments (ATSDR 2000)</td>
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<td>• <strong>damage to the kidneys and bone toxicity</strong>, released if plastic is burned or during high temperature metal processing</td>
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<td>Lead</td>
<td>Circuit boards/ cathode ray tubes CTR (1 – 3 kg per CRT);</td>
<td>• Risk for small children and fetuses</td>
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<td>• <strong>Damage to the nervous system, red blood cells, kidneys and potential increases in high blood pressure;</strong></td>
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<td>• Incineration can result in release to the air</td>
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<td>Mercury</td>
<td>Lighting devices that illuminate flat screen displays, switches and relays</td>
<td>• <strong>Impacts the central nervous system</strong></td>
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<td>• Land filling and incineration of flat panel displays results in the release to the environment</td>
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<td>PCBs (polychlorinated biphenyls)</td>
<td>Insulating fluids for transformers and capacitors, flame-retardant plasticizers</td>
<td>• <strong>Suppression of the immune system, liver damage, cancer promotion, damage to the nervous system</strong></td>
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<td>• Damage to reproductive systems</td>
</tr>
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Some Facts

- One tone of recycled cell phones can generate up to 230 grams of gold.
- More than 70% of a mobile phone can be recycled.
- Current mass of phones being recycled is only about 0.001-0.003% of the total weight of waste electronic equipment each year.
Thank you