



DATE: September 13, 2018
TO: Programs & Administration Committee
FROM: Tom Padia, Deputy Director
SUBJECT: What Happens to E-Scrap?

SUMMARY

Committee members have asked recently for a discussion of what happens to electronic scrap turned in for recycling. Staff have interviewed the General Manager of a large local e-scrap recycling company located in Hayward and spoken with the Program Manager of the Alameda County Household Hazardous Waste (HHW) program which accepts e-scrap along with other HHW materials.

DISCUSSION

The era of console TV's and rotary dial telephones that last for 25 years or more is long gone. Technological innovation and design changes have resulted in a proliferation of consumer electronics that are more powerful, smaller, lighter, cheaper and more quickly made obsolete by the next round of technological advances than ever before. The presence of heavy metals and sometimes other materials have caused these electronics, once discarded, to be considered hazardous or universal wastes, in a similar category to batteries (which many of them have), paint, used oil, mercury lamps (which some of them also have), etc. New electronic products are continually introduced into the marketplace, including items like the public use bikes and scooters which have batteries, circuit boards and other electronic components.

Exposé videos, articles and photos by groups like the Basel Action Network (BAN – see <http://www.ban.org/>) of horrific environmental pollution and human health impacts of primitive e-scrap recycling practices at locations in the developing world have given rise to growing levels of concern about impacts from recycling this stream of materials. Third party certification organizations have arisen, such as R2 (<https://sustainableelectronics.org/r2-standard>) and e-Stewards (<http://e-stewards.org/>) in an effort to provide guidance to consumers and generators wishing to recycle their e-scrap in a responsible manner. There are also third party certifications for destruction of sensitive data contained in electronic devices (see National Association for Information Destruction - <http://www.naidonline.org/>).

The Alameda County HHW program uses an RFP process to select one master vendor who subs out whatever materials they can't handle directly, subject to standards established in the RFP, such as e-Stewards certification for e-scrap, and subject to County approval of all subcontractors. Attached to this memo are downstream vendors flowcharts from the new subcontractor, ERI Direct (www.eridirect.com), showing the flow of different e-scrap components to various processors.

Russ Caswell, General Manager of e-Recycling of California's Hayward plant (www.erecyclingofca.com) explained that his company primarily receives e-scrap from haulers, institutions and businesses but does accept drop-off from consumers. The largest units normally accepted are up to the size of microwaves, printers and faxes, but not large appliances. Once batteries and potentially hazardous components like old PCB capacitors and mercury switches have been removed from incoming scrap, most materials are sent for further dismantling and to a shredder for size reduction and separation of precious metals, aluminum, copper, various grades of plastics and other materials. A small amount of dismantling for reuse does occur. In California, there is very little involvement by manufacturers and retailers, although there is more in some other states due to legislation. Most materials are processed domestically.

RECOMMENDATION

This item is for information only.

Attachments: ERI Downstream Vendors Flowchart

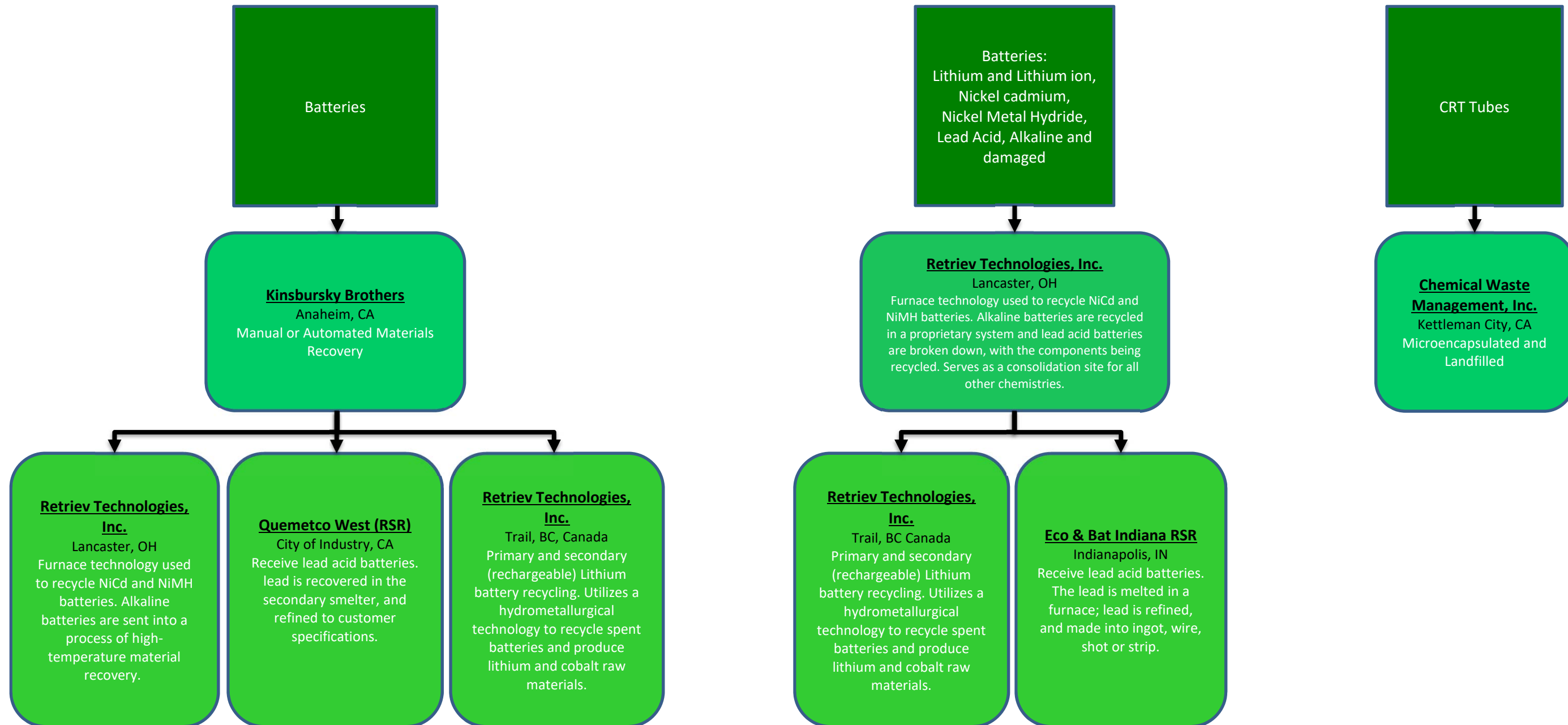
E-Scrap article



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Downstream Vendors Flowchart

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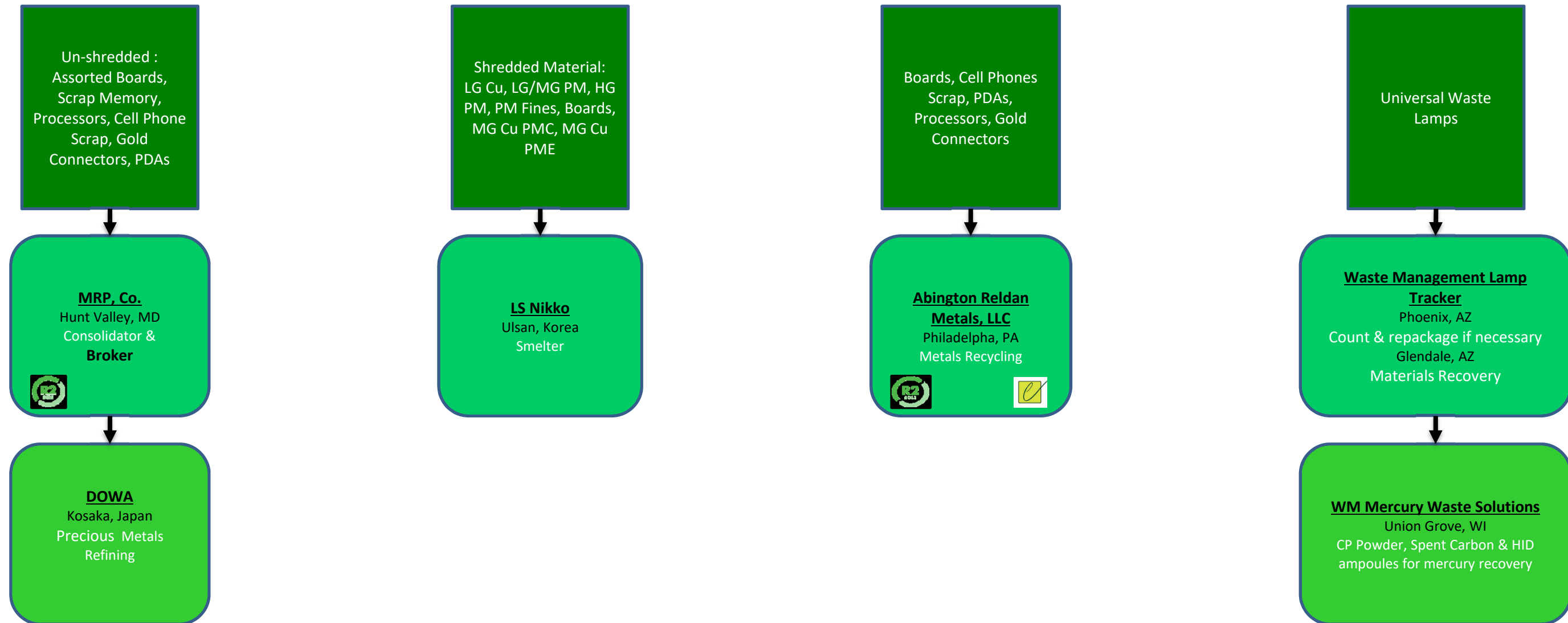
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Legend
LG - Low Grade
MG - Medium Grade
HG - High Grade
Cu - Copper
PM - Precious Metals
PMC - Precious Metals Computer
PME - Precious Metals E-Scrap

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WE KNOW THE WRONG WAY TO DEAL WITH E-WASTE. BUT WHAT SHOULD WE DO INSTEAD?

A handful of firms around the world are working to develop environmentally responsible recycling and disposal strategies. Here's what they have to teach the rest of us.



WRITER
Fred Pearce

British environment
journalist and
author

August 22, 2018 — Rajesh was just 10 years old when we met. His days were spent standing on tiptoe to dunk computer circuit boards into big vats of hot acid. He had gloves but no goggles, and the acid splashed his shirt. He had an incessant cough and drank alcohol at night to ward off dizziness caused by the fumes.

Rajesh had moved with his older brother from the Indian countryside to work in [Mandoli](#), a suburb of the Indian capital New Delhi, which has become a charnel house of the digital world. The vats of acid that he tended removed the copper from

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the circuit boards so it could then be sold to a nearby factory that made copper wire. Somebody made a profit. But in the acrid air and with local well water [contaminated by toxic metals](#), Rajesh's future looked bleak

This scene in Mandoli is a disturbing face of a vast global business in recycling electronic waste. Between [20 and 50 million metric tons](#) (22 and 55 million tons) of used computers, TVs, air conditioners, mobile phones, refrigerators, light bulbs and [other e-waste](#) is produced every year around the world. All of it has to go somewhere, and all of it contains valuable metals — including toxic lead, cadmium and mercury — that are worth reclaiming for future use.

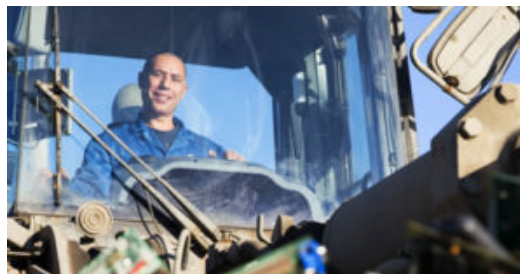
Right now the “urban mining” of precious metals from [e-waste](#) is largely an environmental and social nightmare, polluting landscapes and poisoning its practitioners.

But it needn't be like this.

Contrast Mandoli with the scene at Skellefteå, a neat Swedish gold-mining town close to the Arctic Circle with a famous hockey team. Here a giant industrial smelter [operated by Boliden](#), one of the world's largest e-waste recycling companies, last year smelted [almost 80,000 metric tons](#) (88,000 tons) of scrap e-waste, much of it circuit boards cut from European computers and mobile phones, to extract copper, gold, silver and other precious metals. No vats of acid; no acrid fumes; no 10-year-old workers.

The automated process operates to European environmental and health and safety standards. It is equipped with systems to clean process gases and prevent dust releases. Waste heat generated during smelting is circulated to heat local buildings; and the scant leftovers from smelting are buried in purpose-build stores under the site.

Could this bode a better future for e-waste? Perhaps so. Mainstream metals refining companies are now



sniffing profits from e-waste and touting for business from the U.S. to China.



Belgian refiner Umicore is increasingly tapping e-waste as a source of metals and other valuable materials. Photo courtesy of Umicore

China's Mixed Bag

[Umicore](#) in Hoboken, Belgium, a longstanding European metals refiner, is getting ever more of its [raw materials from e-waste](#). The company's director of European Union government affairs, Christian Hagelüken, says its smelters can extract 400 grams (14 ounces) of gold from a metric ton (1.1 tons) of mobile phones, along with copper, silver, lead, tin and indium. After smelting, the metals in the waste stream are chemically separated. The plastic casings go into the smelter, where they are burned to provide most of the fuel for the facility.

“Over 95 percent of the feed is turned into useful products,” Hagelüken says. The final 5 percent includes toxic elements like mercury and cadmium that have to be disposed of “in a safe way,” plus slag that is used for constructing flood-protection dikes along the Belgian coast.



Materials that can be extracted from mobile phones include gold, copper, silver, lead, tin and indium. Photo courtesy of Umicore

Such advanced processing plants are also turning up in the developing world. China in particular is keen to replace its notorious e-waste villages with high-tech e-waste metals recovery. Its flagship company, [GEM Co. Ltd.](#), says on its website that it aims “[to become the world leader in green enterprises.](#)”

Not every Chinese company is so fastidious as GEM claims to be, however. When Thai police [raided the Chinese-owned Wai Mei Dat Recycling complex](#) east of Bangkok in May this year, they found illegal workers burning waste in the open and spewing dioxin from plastics into the air. The surreptitious site [had been found](#) by the Basel Action Network (BAN), a non-governmental organization that researches international trade in waste, using tracking devices attached to e-waste.

U.S. Initiatives

In the United States, most e-waste is landfilled. A [study](#) five years ago paid for by the U.S. Environmental Protection Agency estimated that 8.5 percent of collected e-waste was exported, with Mexico, Venezuela, Paraguay and China among the most popular destinations.

Some of that trade is legitimate. California-based [ERI](#) collects hundreds of thousands of tons of e-waste a year across the U.S., which it shreds and sells either to its [partner Alcoa's smelter](#) in Massena, New York, or to [LS Nikko](#), an established copper-smelting giant in South Korea.

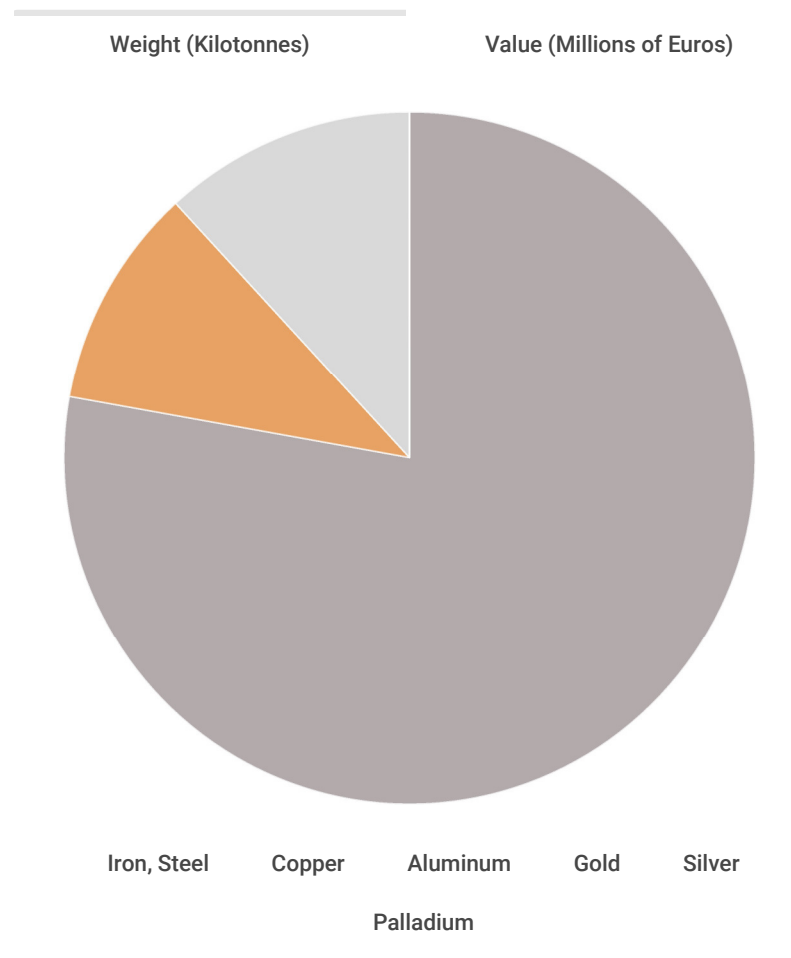
But the BAN has accused several American companies of “scam recycling” — that is, advertising recycling services that simply export to places such as Pakistan and the Philippines where the waste is “smashed, burned or treated with dangerous chemicals” by migrant workers.

Some electronics manufacturers are taking the initiative to improve practice, however. [Dell](#) has been collecting old equipment for a decade to pass on to recyclers for the extraction of precious metals. Apple recently rolled out a robot able to dismantle iPhones, sorting components for ease of recycling “so we can recover materials that traditional recyclers can't,” according to the company's [2018 environmental responsibility report](#).

The company claims to recover aluminum, cobalt, copper, tungsten, tin, silver, tantalum, gold, palladium and various rare earths. It intends to install the robot, known as Daisy, in many consumer countries, with the eventual aim of using only recycled materials in its production processes.

Good Business

E-waste recycling is about more than good housekeeping. What is really driving the industry is the discovery that, in a world where the prices of metals are rising and most conventional mines are in distant countries with poor-grade ores, urban mining of e-waste is good business.



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Electronic Waste Recycled Metals
Infogram

Estimated weight and potential value of select raw materials in e-waste, 2016. Estimated total weight of materials listed is 20,921 kilotonnes, with an estimated value of nearly €40 billion. From Baldé, C.P., Forti V., Gray, V., Kuehr, R., Stegmann, P. : The Global E-waste Monitor – 2017, United Nations University (UNU), International Telecommunication Union (ITU) & International Solid Waste Association, Bonn/Geneva/Vienna.

Copper and gold, which make up more than half the value in e-waste, are now often cheaper to obtain from jettisoned products, says Xianlai Zeng, an associate professor of solid waste management at Tsinghua University in Beijing, China. “Urban mining of e-waste is becoming more cost-effective than virgin mining,” he concluded in a [recent paper](#), after studying the economics of eight recycling plants in the country.

This is not so surprising. There is more gold in a ton of mobile phones than in a ton of ore from a gold mine. One estimate is that all the e-waste discarded annually round the world [contains more than 300 tons of gold](#).

Zeng’s analysis concluded that, with some government subsidies, urban mining in China could recover copper at less than US\$2 a kilogram (2 pounds), which is less than a third of the international market price.

“The total value of all raw materials present in e-waste is estimated at approximately [US\\$55 billion](#) in 2016, which is more than the 2016 gross domestic product of most countries in the world,” says Cornelis Balde, a researcher with the United Nations University to Tokyo.

Huge Opportunities

Some fear that the potential profits from urban mining will lead to an upsurge in rogue operators, with escalating environmental and safety hazards. But more likely — just as poor regular miners soon get muscled out by big corporations when a new geological seam provides rich pickings — urban mines will soon be the preserve of the big operators.

“There are huge business opportunities in e-waste recycling, especially in the big countries of e-waste generation.” —
[Xianlai Zeng](#)

Yet they have a ways to go. Zeng estimates only 20 percent of e-waste is currently handled by the “clean” sector of big companies using largely automated processes. About 40 percent ends up in places like Mandoli, in China’s notorious villages around Guiyu in Guangdong province, or in Agbogboshie, a

district in Accra, the capital of Ghana, which some say is currently the world's largest e-waste dump. The remaining 40 percent is uncharted, often stored in drawers or attics or disposed of in landfills.

“There are huge business opportunities in e-waste recycling, especially in the big countries of e-waste generation,” says Zeng. So sending our e-waste to the back streets of India and China is not only ethically unacceptable, it is also a missed business opportunity at home.

Many ethically concerned consumers are conflicted about recycling e-waste. They applaud the virtues of recycling, but fear the stuff they are done with may end up polluting a Chinese village or poisoning Indian children. With increased awareness of the opportunities in urban mining, that dilemma could soon end. 