Tracking mobile phone recycling rate to improve them

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Multifunctional mobile devices like the smartphone contain small quantities of valuable materials, yet most are not recycled. Something needs to give.

Gara Villalba, who is a chemical engineer and a professor at the institute of environmental science and technology at the Autonomous University of Barcelona, has tracked the flows of materials to see how recycling rates could be improved. It is a significant issue, given that smartphones contain between 500 and 1,000 components, as well as scarce and sometimes toxic metals. She speaks to youris.com about her work as part

of the PROSUITE project, funded by the EU, which combines technology forecasting with product lifecycle approaches.

Tell me about your case study on mobile devices?
This study provides a good example of a highly pervasive technology that poses many challenges for material recovery, metal scarcity and waste management. At the end of our project we hope to assess these technologies to quantify their social, environmental and economic impacts over their entire lifecycle. What this lifecycle approach means is we take into consideration the production of the phone, which includes the extraction and processing of all the metals and all the plastics and materials that are needed, as well as the use phase all the way to its end of life.

The purpose of the project is to provide an assessment that is quantified. So you can think of different scenarios and you can see how any changes in policy impact. For example, for mobile phones we can ask what it would mean to increase substitutes for various metals or increase recycling rates. We can also see how current legislation or policy is getting us closer or moving us further away from closing the material cycle and making these technologies more sustainable.

Are there policies change that would increase recycling of mobile phone?
The WEEE directive on electronic waste which aims to increase recycling rate to 50% by 2015 may not be the best approach because the recycling target is based on the amount of waste that is reported. With cellular phones, they are small and easily stored at home. Not only does this result in losses of potential recovery, but also significant time delays between end of life and recycling of the phones that are properly disposed of. We used a dynamic model to quantify the waste generated over the next decades to estimate the difference between new and recovered materials, or the "resource gap." We found that the directive

does not reduce the resource gap that much. Consumer behavior plays a big role and tactics like take-back incentives should be considered to close the resource gap more efficiently.

What kind of resource metals are going to waste in discarded phones?

What is recycled is quite limited. Precious metals like gold and silver, because of their value, and copper and platinum group metals. However metals which have been determined as critical by several reports in the US and in Europe are not recovered. For example, this is the case with indium, cobalt and germanium. The price of such metals has spiked up to 100-fold in the last few years. But the small quantities and cost and difficulty in separating them mean they are still not recovered from phones.

What is happening to phones in Europe once they are no longer in use?

We estimate that just 12% of phones go directly to proper certified recycling facilities. About 20% are resold as used phones. And about 40% will eventually just be stored at home. The time delay between the end of life and when the phone finally comes to a recycling facility and what a big role that plays in terms of resource depletion. It is a much bigger issue than reaching the 50% recycling target of the directive. What is more about 21% we have as an outflow, but we do not know where that goes. Here, we could possibly talk about landfill or other improper ways of waste management such as backyard facilities in developing countries. But it is hard to quantify this outflow.

Have changes in mobile phone technology made a difference?

Yes, the material content of the phones has changed. In general, smartphones weigh a bit more and they have more of these critical metals and some that were not used before. Touchscreens contain indium, a material which poses a problem because it is non-renewable

and is a byproduct of zinc. Like many of these metals that are scarce, yet critical for technology, it is a byproduct of primary metal production. We call these metals hitchhiker metals. They are not extracted themselves but are attached to primary metals like zinc and cooper.

Do phone manufacturers have a role in making phones more recyclable?

Absolutely, design for disassembly and recovery of these metals is very important, and the current trend for miniaturisation is certainly an obstacle in facilitating recovery.

Recycling technology right now is crunching up cellphones and so-called smelting—heating and melting—them down to extract metals, but recovering such small fractions is still not feasible. One way forward would be to improve the design of these phones to allow for more recycling of materials. Also, a reduction in the diffusion rate of the technology - the same number of phones sold but over longer periods of time - would reduce the resource gap. Obviously companies would not be too happy about this finding.

More information: www.prosuite.org/web/guest/hom … CD72D3997093C6C8B642

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