Landfills – a future source of raw materials

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Decontamination of landfills and open dumpsites could prove profitable – both financially and for the environment. This is demonstrated by Yahya Jani in a new dissertation in environmental science from Linnaeus University.

Environmental pollution, health threats and scarcity of raw materials, water, food and energy are some of the greatest challenges our world is facing today. At the same time, landfills and open dumpsites are still the dominant global waste disposal options, despite the fact that the long-term environmental impact in the form of emissions of greenhouse gases and contaminated leachates is significant. However, much of the environmentally hazardous waste that has been dumped at landfills can be recycled as energy or reused as valuable raw materials in different industries according to Yahya Jani, doctor of environmental science and chemical engineering.

Landfill mining—the tool of the future

In his dissertation, landfill mining is suggested as a tool to achieve an enhanced circular economy model. Viewing the landfill waste as a potential resource instead of as a problem is a common thread in Yahya's research.

"More than 50 percent of the deposited waste dumped at landfills and open dump sites can be recycled as energy or reused as raw materials. These materials can be used as secondary resources in different industries instead of being forgotten or viewed as garbage", Jani

explains.

His research also includes the extraction of metals from Småland's art and crystal glass waste and different fine fractions.

Extracting 99 percent of the metals

"I developed a method that enables the extraction of 99 percent of the metals from the glass waste that was dumped at Pukeberg's glassworks and published the results. It is the first published article in the world that deals with recycling of metals from art and crystal glass", says Jani.

In his research study at Glasriket, Jani also used chemical extraction to recycle materials from a mix of glass waste and soil fine fractions smaller than 2 mm. The technology involves mixing old glass waste with chemicals to reduce the melting point of the glass waste in order to extract the metals.

"The methods I've developed to extract metals from Småland's glass waste can be used to extract metals from all types of glass, like, for instance, the glass in old TV sets and computers. Thus, this method can be further developed at an industrial facility for the recycling of both glass and metals of high purity. This can also contribute to a restoration of Småland's glass industry by providing the industry with cheap raw materials. In addition, the extraction of materials from old landfills contributes to the decontamination of these sites and reduces the environmental impact and health threats" Jani concludes.

According to the European commission in 2017, 60 percent (that is to say, 1,800 million tons) of the annually produced waste from 500 million EU inhabitants end up in landfills. In his dissertation, Jani shows that the extraction of valuable materials from this waste could contribute to reducing the overuse of natural resources on Earth and reduce the

emissions of greenhouse gases like carbon dioxide and contaminated leachates, which are responsible for pollution of water resources. Decontamination of these places will contribute to a significantly reduced impact on both human health and the environment.

The results from Jani's dissertation shed light on the need to view the dumped waste as a secondary resource and landfills and dumpsites as future bank accounts where future raw materials can be extracted instead of viewing them as a burden for human health and the environment.

Yahya Jani publicly defended his thesis "Landfills and glass dumpsites as future bank accounts of resources – waste characterization and trace elements extraction" on February 2, 2018.

More information: Landfills and glass dumpsites as future bank accounts of resources – waste characterization and trace elements extraction

Provided by Linnaeus University