Environmental Science & Technology Letters

Editorial

Cite This: Environ. Sci. Technol. Lett. 2018, 5, 301−301

pubs.acs.org/journal/estlcu

Waste Not, Want It

The continued growth of any company, community, or country eventually becomes limited by a key resource. That is understandable when that resource is some chemical or material that is not abundant, such as a precious metal. But running out of sand? Amazingly, sand is the second most consumed substance in the world after water.

Globally, sand utilization rates are exceeding natural renewal rates, and when that happens, prices go up, availability goes down, and illegal mining operations flourish. There has been a 23-fold increase in the volumetric use of all natural resources between 1900 and 2010, and sand and gravel make up 79% of that material. Sand is used in concrete, with an estimated amount of 10 billion tons of concrete being produced each year, largely for new construction in Asia.

In some areas of the world, satisfying this voracious appetite for sand has had environmental consequences. Of course, the severity of an environmental impact due to sand extraction depends on where the sand is, where it is needed, and how it is obtained. In the Mekong Delta, sand mining during the dry season has increased saltwater intrusion, affecting the potable water supply, and in Sri Lanka, it has resulted in severe declines in crop productivity. Dredging for sand can impact corals and seagrass meadows and contribute to biodiversity losses. In Poyang Lake in China, removal of tens of millions of tons of sand has significantly altered the water level, impacting the access of birds to aquatic vegetation, which is of special concern during the winter months and times of extensive bird migration. Not all sand is the same: river sand is generally considered to be the best type for construction uses, because of its particle size and shape. Illegal river sand mining in India has led to the environmental degradation of the Yamuna River and declines in the Ganges River dolphin and terrapins.

At the same time, we are digging up sand at an ever increasing rate and continue to toss our limited resources into the trash and bury them, rather than finding ways to better sort and recycle what we can. Electronic waste, or e-waste, is a particularly troubling and increasing problem. E-Waste is the among the fastest growing types of waste, with more than 40 million metric tons produced each year, with 50 million tons estimated to be produced in 2020. Of the metals used in e-waste, ∼50% are just two metals: copper and gold. Xianlai Zeng and colleagues in a recent paper in *Environmental Science and Technology* argued that urban mining of this e-waste not only makes more sense than virgin mining of these metals but also could actually be more cost-effective. Transfer of e-waste from industrialized countries to developing nations, when this waste is not properly handled or disposed of, can be detrimental to the health of people in those nations in the short term, and a lack of long-term vision on the environmental consequences and shortages of precious metals and other materials will impact future generations.

The first step in sensible reuse is sorting. They took away the garbage pail in my office a few years ago, and I could not be happier. Penn State University, and many other progressive universities, companies, and cities, are committed to recycling as much of the materials used in their operations as possible. Instead of a garbage pail, I now have two storage bins: one for paper, and one for later sorting. Any food or compostable waste goes directly into a shared bin in the hallway. For all other materials, we have a series of bins in the hallway for office paper, newspaper, plastic, bottles, aluminum cans, and one for materials that do not fit into these categories called trash (with a sign over it saying "Are you sure?"). Every few weeks, I transfer materials from my two storage bins into those in the hallway. It is easy and convenient, and it has greatly reduced trash going to the landfill from our campus.

The subjects of waste and recycling are not considered glamorous (and I suspect a significant fraction of the people that started reading this editorial have moved on by this point to do something else). These subjects are not even likely to appear in journals like *Environmental Science and Technology* or *Environmental Science and Technology Letters* given that so much of waste materials handling is not really related to environmental science. So why did I decide to write an editorial about these topics? Because the fate of our used materials is important, and ultimately the use and disposal of these materials will have severe environmental consequences. The world is using more and more resources. When you start to run out of things as ordinary as sand, it is long past the time to pay serious attention to the fate and reuse of all our resources. The road to reuse starts with used materials sorting, with plans of putting used materials into the ground only as a last resort. Sorting and recycling need to be mandatory, for everyone, everywhere in the world. For e-waste, sorting could start with requiring companies that produce electronic materials to take them back when their useful time is over (or when users just get tired of them) and recycling the units or materials to the maximum extent possible. We are already seeing a transition in water engineering as we are redefining our wastewater treatment plants as used water treatment plants or resource recovery plants. Water is a resource, not a waste, and resource recovery from these treatment systems would be a great advance in improving the sustainability of our water infrastructure. Similarly, it is time to end using the word trash, and start using the words "used materials" and closing the loop on materials used by avoiding materials mixed randomly in landfills.

Bruce E. Logan

AUTHOR INFORMATION

ORCID

Bruce E. Logan: 0000-0001-7478-8070

Notes

Views expressed in this editorial are those of the author and not necessarily the views of the ACS.

Received: May 4, 2018
Accepted: May 7, 2018
Published: May 14, 2018

DOI: 10.1021/acs.estlett.8b00239
Environ. Sci. Technol. Lett. 2018, 5, 301−301