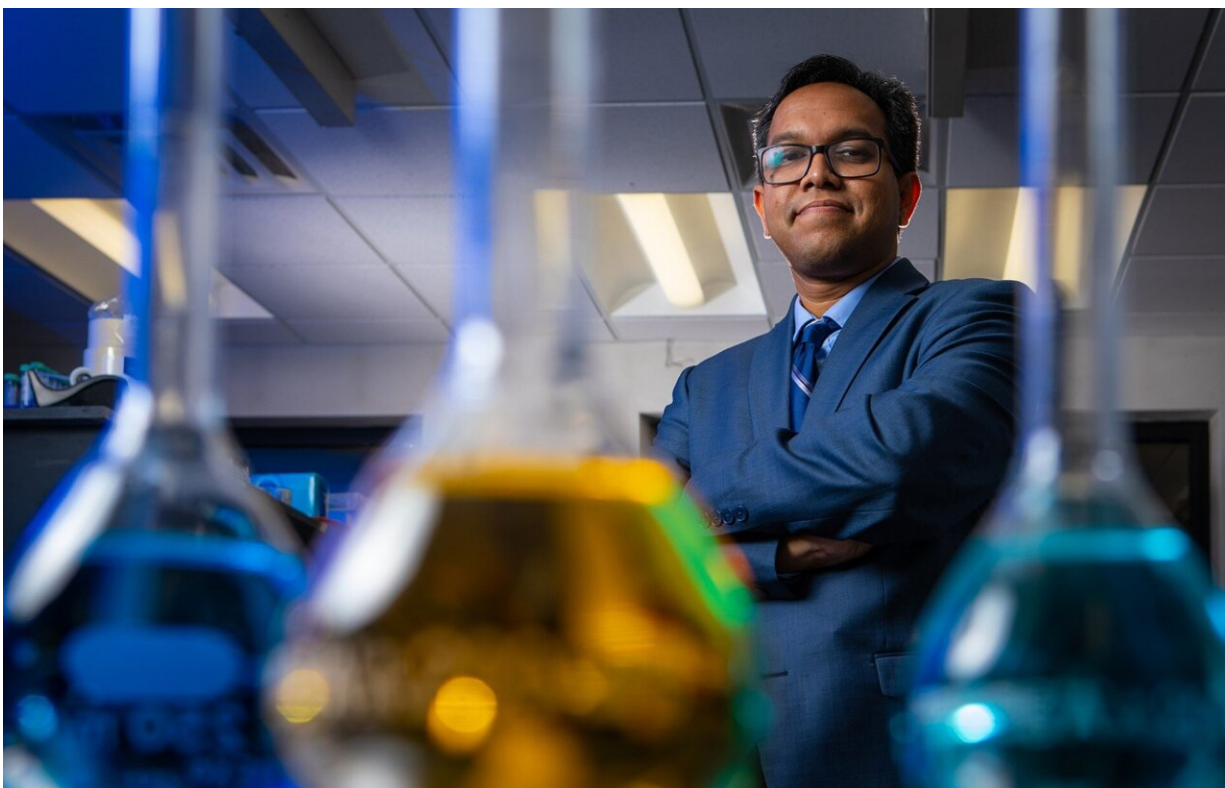


Studies in Bangladesh detail how e-waste recycling exposes workers to chemicals

September 13 2022, by Alexis Nicholson



Nirupam Aich, an environmental engineering professor at UB, is a partner on an international team that is studying the effects of informal e-waste recycling on workers in developing countries. Credit: Douglas Levere / University at Buffalo

Nirupam Aich, University at Buffalo engineering researcher, set out to study the hazards of electronic waste recycling after learning about

illegal shipments of this waste from developed countries, such as the United States, to developing countries, including Bangladesh.

Electronic waste, also known as [e-waste](#), refers to any electrical products, from computers to [household appliances](#), that are no longer in use and subsequently thrown away.

In Bangladesh, there aren't enough resources allocated for formal recycling plants for the e-waste, Aich says. As a result, many children, homeless people and senior citizens work in the street or in poorly ventilated facilities with no personal protective equipment, he says. These workers disassemble the [electronic devices](#) for their parts, separating and gathering the insulated copper wires, [circuit boards](#), glass, metals and plastics by hand.

Aich, Ph.D., assistant professor in the Department of Civil, Structural and Environmental Engineering in the UB School of Engineering and Applied Sciences, partnered with additional UB scientists and researchers from the University of Toronto, the Bangladesh University of Engineering and Technology (BUET) and the International Center for Diarrheal Disease Research, Bangladesh (icddr,b) to investigate and track the effects of e-waste recycling on workers. Different team members led different portions of the research.

The first findings have been published in journals focused on hazardous materials, the environment and health. These journals include *The Lancet Planetary Health*, *Journal of Hazardous Materials Advances*, and *Science of the Total Environment*.

"Discarded electronics contain a lot of different types of toxic chemicals, metals and carcinogens, which can affect the environment and human health. Our research is looking into the extent of environmental pollution and human health effects from [electronic waste](#)

," Aich says. "We are particularly interested in understanding the effects on e-waste recycling workers and their families, including children and pregnant women, who are the most vulnerable groups that are getting affected. In many countries, including Bangladesh, there are a lot of children working in these e-waste facilities. Child labor is very frequent in this industry."

The scientists observed the working conditions of e-waste recycling shops around Dhaka, Bangladesh and collected samples of dust for analysis.

Here are some of the findings:

- Toxins such as [heavy metals](#) and [organic chemicals](#) were released into the environment (the air, water, soil, etc.).
- Among the tested metals, high levels of nickel, copper and lead were present in the air of the e-waste facilities studied. Concentrations of manganese and chromium were also present. Levels of individual chemicals varied by shop.
- Workers spent an average of nearly 7.5 hours inhaling these pollutants on work days, with ingestion and contact with skin posing additional risks.
- Silicone wristbands worn on the wrists of workers collected flame retardants as well as other chemicals.
- T-shirts worn by the workers also carried the same chemicals. When worn outside the workplace, the chemicals could potentially spread to other people and environments, the scientists say.

Aich and his partners hope their research will encourage efforts to build safe e-waste recycling facilities. They also hope that the increasingly popular e-waste industry will become regulated so that it will be better managed.

As a sign of change, the Bangladesh Department of Environment, a governmental agency, recently published rules related to e-waste management and recycling. These can now be used to reduce harmful aspects of the industry. Some of the regulations address transport and handling of e-waste, with fines attached if the rules aren't followed.

Nafisa Islam, Ph.D., associate professor of chemical engineering at BUET, and a partner on the research, thinks that Bangladesh is taking a step in the right direction. But she also believes that more must be done.

"There is still a lot of work to be done to implement the new regulations regarding e-waste management," she says. "Household accountability for e-waste needs to be ensured. The definition and hazards of e-waste, along with the regulations regarding their disposal, must be communicated widely. Every city corporation can come forward to ensure coordinated handling of municipal solid waste and e-waste."

"My motivation for engaging in this research was two-fold," Aich says. "On one hand, I wanted to understand the global impact of nanotechnology, which gave rise to the continuous miniaturization of electronics. On the other hand, I wanted to contribute my knowledge and expertise about environmental pollutants to detect and solve important public health problems in my home country, Bangladesh. These two aspirations converged as I realized the importance of understanding the e-waste problem in Bangladesh—a [developing country](#) that has been going through exponential economic growth and rapid digitization for the last decade."

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