University at Buffalo
Department of Civil, Structural and Environmental Engineering
School of Engineering and Applied Sciences

Environmental and Water Resources Engineering

E-waste as the end product of our digital revolution

Abstract: Digital technologies are now acknowledged as humanity's fourth major information revolution over the past 4000 years and our fourth major technological revolution since the 1800s. Digital technologies are revolutionizing human and societal interactions and activities at inter-personal to global scales in virtually every sector. Western societies are predisposed to adopt new technologies and with this predisposition, our societies are remarkably unreflective about the negative unintended consequences and rebound effects of those technologies.

A major unintended consequence of the digital revolution is e-waste. Global "production" of e-waste has been estimated at 40-50 million tonnes per year, or the equivalent of about 1/10 of human global biomass. E-waste presents great challenges for handling safely as it contains numerous toxic elements and chemical compounds, most of which are essential to their functioning. In addition, economically viable "complete" recycling processes are limited.

We have sought to understand the "e-waste landscape" in this broad context and specifically with respect to the exposure of e-waste dismantlers to flame retardants. Our study of e-waste dismantlers in Ontario suggested that some workers could be exposed to flame retardants at levels that exceed those in some informal recycling facilities in Low Income Countries. We question whether legislation and policies at international, national and provincial scales are sufficiently protective. Finally, perhaps the greatest irony is that population-scale behavioural trends could reduce the impetus for solving the growing challenge of dealing with e-waste.

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Miriam Diamond is a professor in the Department of Earth Sciences with cross-appointments to the Department of Chemical Engineering and Applied Chemistry, the Dalla Lana School of Public Health, School of the Environment, Department of Geography and Program in Planning, and the Physical and Environmental Sciences Program at Scarborough College. She received her B.Sc. in Biology from the University of Toronto (1976), M.Sc. from the University of Alberta in Zoology (1980), M.Sc.Eng. from Queen's University (Kingston, Ontario) in Mining Engineering (1984), and her Ph.D. from the Department of Chemical Engineering and Applied Chemistry from University of Toronto (1990).The goal of Prof. Diamond's multidisciplinary research program is to improve our understanding of chemical contaminants from emission, through to transport indoors and outdoors, and ultimately to human and ecological exposure. This research has been published in over 160 peer-reviewed articles and chapters, in addition to receiving media attention. Prof. Diamond is an Associate Editor of the journal *Environmental Science and Technology* and sits on the Editorial Review board of *Journal of Exposure Science and Environmental Epidemiology*.

Date: November 16, 2018 Time: 12:00 p.m. to 1:00 p.m.
Location: 223 Jarvis Hall, North Campus, University at Buffalo