

Bioreactor Simulator Design: Measuring Built Environment Health and Ecological Implications from Post-Consumer Textiles

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Abstract : The United States exports over 1.6 billion pounds of post-consumer textiles every year, primarily to countries in the Global South. These textiles make their way to landfills and open-air dumps where they decompose, contaminating water systems and releasing harmful greenhouse gases. Through this inequitable system of waste disposal, countries with less political and economic power are coerced into accepting the environmental and health consequences of over-consumption in the Global North. Thus, the global trade of post-consumer textile waste represents a serious issue of environmental justice and a public health hazard. Our research located, characterizes, and quantifies the environmental and human health risks that occur when post-consumer textiles are left to decompose in landfills and open-air dumps in the Global South. In our work, we make use of United Nations International Trade Statistics data to map the global distribution of post-consumer textiles exported from the United States. Next, we present our landfill simulating reactor designed to measure toxicity of leachate resulting from the decomposition of textiles in developing countries and to quantify the related greenhouse gas emissions. This design makes use of low-cost and sustainable materials to promote frugal innovation and make landfill reactors more accessible. Finally, we describe how the data generated from these tools can be leveraged to inform individual consumer behaviors, local policies around textile waste disposal, and global advocacy efforts to mitigate the environmental harms caused by textile waste.

Keywords : sustainability, textile design, public health, built environment

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