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Analysis of Macro- and Microplastics in Riverine, Riverbanks, and Irrigated Farms in Arusha, Tanzania

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Abstract

Microplastics and macroplastics have been reported in different urban rivers and agricultural soil across the globe. However, the interlink between them has not been previously assessed. The present study evaluated the relationship between macro- and microplastics in the surface water and sediments in riverine, riverbanks, and soils from irrigated farms in Arusha, Tanzania. Detached pieces from macroplastics and suspected particles of microplastics from the samples were analyzed using the total attenuated reflectance–Fourier transform infrared spectroscopy. Statistical analysis showed that the number of microplastics in the sediments was higher than those in the surface water and that in irrigated farms was of four times higher than those found in riverine. Besides, the numbers of microplastics and macroplastics in the irrigation farms were exponentially related, while the macroplastics from the riverbanks had an inverse relationship with the rivers' profile elevation. Macroplastics of polyethylene type dominated in the riverbanks and irrigated farms with an occurrence frequency of 100%, while polystyrene was abundant in all analyzed microplastics samples. In addition, those irrigation farms adjacent to canals had a significant number of microplastics and macroplastics than the distant farms. This study provides new information for the region and others that divert water from an urban river for irrigation.