

Microplastics in the Ganga River: Sources and Pathways to the Sundarbans Biosphere Reserve

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The Ganga and Brahmaputra rivers form one of the world's largest delta and mangrove forests—the Sundarbans Biosphere Reserve. However, the region has become fragile due to climate change, sea-level rises, tropical cyclones, salt-water intrusions, and pollutants from anthropogenic activities. Here we present the source, type, and pathways of microplastics (MPs) in water ($n = 10$) and sediment ($n = 17$) samples collected from 17 critical locations along the Hooghly River—an eastern distributary of River Ganga in the State of West Bengal—downstream from the megacity of Kolkata up to Sundarbans Biosphere Reserve. The average concentration of MPs in water (718 ± 244 items/ m^3) and sediment (428 ± 266 items/kg dw) was found to be higher compared to other Indian rivers. Attenuated Total Reflectance - Fourier Transform Infrared spectroscopy data revealed that high-density polyethylene (33 %) was the most prevalent polymer type in both sediment and water samples, followed by polyoxymethylene or polyacetal, (18 %), polyphenylene sulfide (18 %), polyacrylamide (13 %), polypropylene (7 %), polytetrafluoroethylene (6 %), and polybutadiene (5 %). The fiber was the most dominant shape in water (76 %) and sediment (63 %). The most dominant color of the microplastic was found to be white in water (53%) and sediment (46%) samples. The MPs present a higher proportion in sediment 0.3 mm-90 μ (49%) and water samples 1-0.3 mm (45%), suggesting a high degradation rate. Our findings suggest that the dominant presence of MPs in the river appears to be a serious concern mainly because the water from the river is the major contributor to drinking purposes in urban and rural areas along the river. The river Hooghly transported MPs is one of the factors for ecological risks in the Sundarbans Biosphere Reserve.