

Synthetic rubber waste: the stealthy occurrence of an overlooked category of microplastics in marine and coastal environments of Sri Lanka

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The health and environmental consciousness of the scientific community concerning plastic waste has increased vastly over the years and has motivated several reviews in policies and legal frameworks in Sri Lanka. However, addressing the issue of marine pollution by microplastics demands more attention to overlooked contaminants and their sources. This study provides evidence for the occurrence of synthetic rubber waste as an important category of microplastics that ultimately result in marine pollution. A total of 60 samples were collected from January, 2020 to December, 2021 based on a random sampling of road dust and surface coastal sand in Colombo, surface waters around the Kelani River mouth, and surface waters from off Colombo, to examine the presence and the potential sources of microplastics originating from synthetic rubber. Microplastics in the size range of 0.1–5 mm were examined in this study. Samples were subjected to wet sieving over 5 mm mesh, and density separation using Sodium chloride. Particles were examined using Microscopy and Fourier transform infrared spectroscopy. The results reveal that about 7–23% of microplastics on average were synthetic rubber. The river outfall and coastal waters appear to be more polluted by synthetic rubber microplastics compared to offshore waters ($p < 0.05$). The chemical composition and morphological characteristics of particles in road dust and out-falling river water exemplified similarities, and indicate a likelihood of generation from the wearing process of automobile tyres. Synthetic rubber was common among smaller particles, indicating a weighty inverse relationship between occurrence levels and particle size ($p < 0.05$). More insights on the generation, occurrence, and fate of road waste and synthetic rubber microplastics are required, while the spatial and temporal variations in occurrence levels that show associations to the rainy and dry seasons should be further explored. The improvement of infrastructure to mitigate contamination of watercourses by road waste is a considerable approach to curtail this issue. However, the effectiveness of such preventive measures must be examined against similar systems that have been implemented in other countries.

Keywords: marine debris, marine pollution, microplastics, road waste, synthetic rubber

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