

Assessment of Outdoor Airborne Microplastics in Selected Coastal Areas Along the Colombo Coastal Line, Sri Lanka.

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Airborne microplastics (AMPs) are fine plastic particles suspended in the atmosphere, increasingly recognized as an emerging environmental pollutant due to their potential impacts on ecosystems, atmospheric processes, and human health. In Sri Lanka, research on AMPs, particularly in the coastal and urban atmospheric environments, is still limited, with most studies focusing on aquatic and coastal systems. Therefore, this study investigated the presence of AMPs at selected locations (Kollupitiya railway station, Bambalapitiya railway station, Bambalapitiya marine drive, Wellawatta railway station, Mount Lavinia beach area, and Moratuwa beach area) representing different levels of human activity and coastal influence along the Colombo coastal belt for comparison of AMPs abundance. Air sampling was conducted at six selected locations along the Colombo coastal belt. A total of 14 samples were collected from February to April 2026 during morning and evening periods, with duplicates. A modified vacuum-based sampler fitted with a metal filter holder and 2.5 µm cellulose filter papers was used to collect the AMPs. AMPs were collected over a fixed exposure period of 15 minutes at each sampling location. Collected samples were analyzed using a digital stereomicroscope and categorized according to morphological features such as particle type, shape, and color. Subsequently, Nile Red staining was applied to confirm the presence of microplastics based on their fluorescence properties. The results indicated that the highest concentration of AMPs was recorded at Wellawatta Railway Station, with an average of $(88.88 \pm 22.22 \text{ particles m}^{-3})$ 80° 9'18.58"E. The lowest count was recorded at Mount Lavinia beach area ($5.55 \pm 5.55 \text{ particles m}^{-3}$). Comparing the types of microplastics, type fibers were the most abundant, followed by fragments as the second most dominant category. The color distribution indicated the following trend: Red < Black < Blue. A Kruskal–Wallis test indicated statistically significant differences in total AMPs abundance among sampling locations ($p < 0.05$). The highest abundance was recorded in highly urbanized areas, while the lowest abundance showed high variability, likely due to temporal fluctuations in human activities, traffic density, and wind conditions across sampling periods. Overall, the results demonstrate that anthropogenic activities and local environmental conditions strongly influence AMPs distribution, highlighting the need for improved waste management, increased public awareness, and further research.

Keywords: *Airborne microplastics, Colombo, Coastal environment, Outdoor*