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Investigating the efficacy of green intervention to reduce exposure from local sources of airborne particulate matter (PM)

HASSAN AFTAB SHEIKH[1], BARBARA A. MAHER[2], ANDREW W. WOODS[1], PO-YEN TUNG[1] AND RICHARD HARRISON[1]

[1]University of Cambridge
[2]Lancaster University
Presenting Author: has57@cam.ac.uk

Roadside green infrastructure (GI) can influence local air quality through changes in airflow and resultant PM dispersion and/or deposition of PM on its leaves. In urban settings, the contribution of vehicular air pollution has been linked to several health implications, to which young children are especially vulnerable. Carefully designed GI next to roads can potentially reduce particulate air pollution levels locally. However, there have been reported differences in the effects of roadside GI on roadside particulate matter (PM) depending on whether empirical or modelling approaches have been taken. Here, we report an experimental study of the effects of roadside vegetation designed and installed at a primary school located next to a heavily-trafficked in Manchester, UK. We investigated the potential deposition and transport mechanisms of anthropogenic PM, from the micro- to the nanoscale from their source to its sink. We measured leaf-deposited magnetic PM and compare the findings to traditional air quality monitoring pumps (with size fractions $<PM_{2.5}$ and $>PM_{2.5}$) placed at different sites: roadside of the hedge, school side, and playground (40 m away from the road). We also demonstrate PM deposition on leaves through magnetic proxies that are sensitive to iron oxide particles of different sizes and composition, complemented this with electron microscopy. Our results from experimental data are compared with modelled advection-diffusion-dispersion of different PM fractions (size, density etc.). The results highlight the utility of magnetic proxies in determining the efficacy of roadside vegetation in reducing PM exposure in proximity to heavy-trafficked zones.