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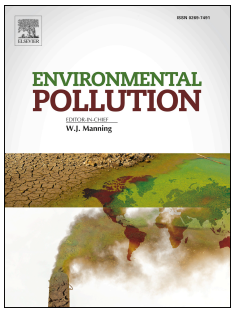

Contamination of agricultural soil by urban and peri-urban highways: An overlooked priority?

M.G. Kibblewhite

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Contamination of agricultural soil by urban and peri-urban highways: an overlooked priority?

M.G.Kibblewhite[1]

[1]Cranfield University, United Kingdom. m.kibblewhite@cranfield.ac.uk

Abstract

Highways are major, open and dynamic sources of contaminants that present a risk to adjacent agricultural soils. Urban and peri-urban soils are particularly at risk because of a greater density of nearby highways with high traffic volumes. In developing economies, these soils support valuable food production and income, while in more developed economies there is a growing interest in urban food production. This commentary highlights the need to better characterise the sources, pathways to and impacts of highway contaminants on agricultural soils and it suggests research priorities. Soil contamination from highways includes metals, toxic organic pollutants and plastics (including large amounts of tyre dust). Contaminants from vehicle emissions and from wear of vehicles and highways are transferred to soil in airborne particulates, dust, splash, spray and runoff. Contamination is greatest near to the highway edge but can extend to > 50m. Levels of metals including As, Cd, Cr, Cu, Pb, Ni, Zn in some soils adjacent to highways may exceed thresholds above which there is a potential risk of harm to food production. Elevated levels of non-threshold carcinogens (e.g. polycyclic aromatic hydrocarbons (PAHs)) in soil adjacent to highways are widely reported, with significant attribution to highway emissions. Mitigation options include improved vehicle design and performance, porous asphalt pavements, physical and vegetative barriers and better drainage. Research priorities include: (1) targeted soil monitoring to identify where highway contamination already presents a significant risk of harm to food production and to identify and assess trends in response to mitigation measures; (2) studies to assess the role of tyre particulate in transporting and releasing contaminants that are hazardous to soil (3) assessment of the risk to soil from pesticides used in highway maintenance; (4) analysis to inform a new emphasis on controlling soil pollution by innovative highway design and maintenance.

Keywords: Urban food, soil, contamination, highway, road

Summary:

Highways are significant sources of pollution of agricultural urban and peri-urban soil. Metal pollution is understood, but there are important gaps in knowledge about the risks from other contaminants.

Introduction, scope and main objectives

Urban and peri-urban soils support food production. The strategic importance of this production to urban food security is debated (Badami & Ramankutty, 2016) but is significant, including in the expanding mega cities. In developing economies, this production provides food but also valuable income, including importantly for women. And there is an increasing interest in the multifunctional use of soil in the urban environments of developed economies (Zasada, 2011) with an emphasis on local food production (Wortman & Lovell, 2013). However, urban soil contamination presents risks to human health (Li et al., 2018). Highways are sources of soil contaminants that may compromise healthy food production, especially in urban and peri-urban areas, where the density of road networks and higher traffic volumes mean that the