

Plastic pollution to soil in the UK

Briefing Note

Introduction

Plastic pollution to soil is an issue that has come to the attention of researchers only recently as most focus has been on plastics entering our marine and freshwater systems. As researchers develop their knowledge of sources of plastic pollution, they have predicted greater mass flows of plastics to soils compared to aquatic systems. This short paper lays out the issues and proposes solutions using already existing alternatives and systems that can largely avoid much of this contamination.

There are avoidable and currently difficult to avoid sources of plastic pollution to soils.

Currently difficult to avoid

From a study released in 2020 by DEFRA¹ we already know that microplastics from the wear and tear of tyres are entering our water courses. This year a report from Suez² shows that some 63,000 tons of microplastics are estimated to leak into the environment from tyres. Whilst the focus of both reports is on water courses, it is clear that such pollution is deposited on soil too, especially near roads.

To avoid this a redesign of tyres is required. In many EU countries, national EPR systems for tyres operate to avoid dumping in the environment. Such a policy would be intelligent here too.

A second source is derived from spreading to land of sewage sludge used as a substitute for chemical fertilisers and containing considerable nutrient value.

While the “down the drain” contribution of microplastics to sewage sludge is difficult to avoid, sewage sludge, containing microplastic particles such as microplastic fibres from clothes, is a vector for these plastic types to soil where spread. Possible solutions to reduce this issue are proposed below.

Avoidable

A 2017 review from UKCEH³ illustrates that the volume of plastic and microplastic contamination of soils is likely to be as great, if not greater, than plastics entering water courses.

There are multiple sources of plastics to soils including as a result of the intentional use of plastics in farm practices. These include soil mulch films; tree guards; clips on fruit trees/bushes; bale wraps. During or after use these can leave plastic particles in the soils. Whilst soil mulch and bale wraps are generally collected after use, then they can fragment while they are in use or during removal and these smaller particles can accumulate year after year if this activity is carried out repeatedly in the

¹ <https://www.gov.uk/government/news/tyre-particles-are-contaminating-our-rivers-and-ocean-study-says>

² <https://www.mrw.co.uk/news/suez-warns-tyre-wear-contributing-to-microplastic-pollution-06-04-2021/>

³

https://www.researchgate.net/publication/313358945_Microplastics_in_freshwater_and_terrestrial_environments_Evaluating_the_current_understanding_to_identify_the_knowledge_gaps_and_future_research_priorities

s

same fields. Tree guards and clips are generally left in place and may take years or decades to degrade and should be collected from nature when no longer serving the intended purpose.

The BBC reported⁴ in February 2021, on how soil is polluted with microplastic particles left after the extraction or even the ploughing of some 45,000 ton/annum of plastic soil mulch films used by farmers to protect crops.

A second source is derived from spreading to land of compost and digestate, like sewage sludges used as a substitute for chemical fertilisers and containing considerable nutrient value.

The Environment Agency estimate that the equivalent of 150 plastic⁵ carrier bags per ton of compost/digestate is spread to soil in the UK. Around 3-4 million tons of compost and digestate is currently spread to soil per year, i.e. containing plastics equal to circa 450 to 600 million plastic carrier bags annually. The Environment Agency has proposed new quality protocols to dramatically reduce this contamination.

Perhaps the largest avoidable source of plastics entering soil systems is from littering. The Government has an anti-littering policy and it is hoped that the implementation of EPR and DRS proposed in current Government consultations, along with increased funding for waste collections and recycling, will reduce littering considerably (see below).

Health impacts

We now know for certain that plastics entering our soils break down into microplastics and through plant root systems and animal grazing, have the potential to enter our food chain⁶. We also know that plastics accumulating in soils can have a negative effect on soil health, fertility, microbial activity and plant growth⁷. It has been demonstrated that plastic particles can change soil properties such as soil aggregate structure, water holding capacity, and microbial diversity and functioning.⁸ We know further that plastic accumulation is increasing and without changes to business as usual will continue to grow. Microplastics entering our food chain have disruptive impacts on human endocrine systems.⁹ A precautionary principle should be applied in case of doubt.

Solutions to avoidable plastic pollution of soil

Contamination of soils from avoidable sources can be solved by making upstream changes that require virtually zero Government spending on infrastructure.

1. As mentioned above, the Government already has anti-littering policies in the public consultation process and has announced a future consultation on the use of single use plastics. Taxing through EPR,¹⁰ introducing DRS¹¹, the Plastic Tax¹², including the cost of

⁴

<https://www.bbc.co.uk/future/bespoke/follow-the-food/why-foods-plastic-problem-is-bigger-than-we-realise.html>

⁵

[https://www.gov.uk/government/publications/waste-quality-protocols-review/waste-quality-protocols-review?ct=\(EMAIL_CAMPAIGN_4_2_2020_12_15_QP\)](https://www.gov.uk/government/publications/waste-quality-protocols-review/waste-quality-protocols-review?ct=(EMAIL_CAMPAIGN_4_2_2020_12_15_QP))

⁶ <https://www.sciencedirect.com/science/article/pii/S0013935120305703?via%3Dihub>

⁷ <https://www.mdpi.com/2076-3298/7/5/38/pdf>.

⁸ de Souza Machado, A. A.; Kloas, W.; Zarfl, C.; Hempel, S.; Rillig, M. C., Microplastics as an emerging threat to terrestrial ecosystems. *Global Change Biology* **2018**, *24*, (4), 1405-1416.

⁹ <https://www.ciel.org/plasticandhealth/>

¹⁰

https://consult.defra.gov.uk/extended-producer-responsibility/extended-producer-responsibility-for-packaging/supporting_documents/23.03.21_EPR_Consultation.pdf

¹¹ <https://consult.defra.gov.uk/environment/consultation-on-introducing-a-drs/>

¹²

<https://www.gov.uk/government/publications/introduction-of-plastic-packaging-tax-from-april-2022/introduction-of-plastic-packaging-tax-2021>

littering in the EPR levies, will all reduce the use of and increase the capture of plastic products that are commonly littered and contribute to reducing avoidable plastic pollution in soils.

No supplementary action required.

2. Soil mulch and bale wraps, tree guards and clips in farming can be produced (as the BBC pointed out) from materials that are certified to biodegrade in soil. The UK has an international standard of reference, the BS EN 17033 approved in 2018 for exactly this purpose. Soil biodegradable materials cost more than traditional plastics due to small scale use and production. By mandating the introduction of soil biodegradable materials (over a period of say five years) production would rise and prices fall.

Action: for Government to verify the feasibility of mandating the use of soil biodegradable film mulch and bale wraps using the standard BS EN 17033 as point of reference.

3. Compost and digestate spread to soil. The Environment Agency is imposing upon waste operators new, stringent limits to plastics entering their treatment facilities and thus also in the outputs. This is to be supported, as removal as close to source as possible is the most effective and cheapest. Defra is considering that (when this mandate enters into force in 2024) all household food and garden waste is collected using only compostable bags certified to the standard BS EN 13432 which was recognised into law in the UK in 2000. This would lead to a dramatic decontamination of food and garden waste entering treatment and therefore going into outputs, but could go further and collect food waste directly from reusable and washable containers (no bags). Such a mandate requires Government legislation with the framework on the Resource and Waste Strategy and is a solution which Defra is studying.

Action: Defra to include the obligation for the collection of food and garden waste for treatment in composting and anaerobic digestion to be with certified compostable bin liners according to the standard BS EN 13432 or “naked” i.e. without bags.

4. Sewage sludge. This is more difficult to resolve. In some EU countries sewage sludge cannot be spread to soil, but must be incinerated because of the contaminants it contains or the lack of land upon which to return the carbon and nutrients. One solution is to mandate the use of microplastic filters on all washing machines¹³, which would give a positive outcome not just for soils but also for water courses.¹⁴

Action: Government to investigate the feasibility of mandating the installation of microplastic filters on all washing machines sold in the UK post (for example, 2023).

¹³ <https://www.sciencefocus.com/news/microplastics-laundry-filters-dramatically-reduce-fibres/>

¹⁴ [Sink to River - River to Tap - A review of potential risks from nano-particles & microplastics \(ukwir.org\)](#)