

Tackling Microplastic Pollution in the UK

Evidence and priority actions for the next five years (2026-2031)

All-Party Parliamentary Group on Microplastics
2026

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This Report was researched and funded by the National Federation of Women's Institutes and the Global Plastics Policy Centre, University of Portsmouth, acting in support of the APPG on Microplastics.

We thank the many organisations that contributed evidence, expertise and insight to this inquiry. The APPG's findings and recommendations have been informed by the evidence received from a wide range of stakeholders.

The inclusion of the organisations below recognises their participation in the inquiry process and contribution of evidence. It should not be taken to imply that participating organisations endorse all of the report's findings or recommendations.



FISHER & PAYKEL



Matter.



THE SCARAB TRUST



Wildlife and Countryside



About

The UK Parliament's All-Party Parliamentary Group on Microplastics (the Group) brings together parliamentarians and stakeholders to examine the environmental and human health impacts of microplastic pollution, and to identify practical actions to address them. Established in September 2020 and chaired by Alberto Costa MP, the Group provides a forum for evidence sharing, policy discussion, and cross-sector engagement. Its Secretariat is provided by the National Federation of Women's Institutes.

This report presents the findings of the Group's second inquiry into microplastics, conducted in 2026. This follows the first inquiry and report published in 2021 and responds to increasing evidence of widespread environmental contamination and growing public health concern, with a focus on the UK's national policy response. The report draws on evidence from a wide range of stakeholders, including academia, industry and environmental organisations, submitted through an open call, alongside academic research, to provide an updated assessment of sources, impacts and policy gaps, and to set out priority actions for government.

The National Federation of Women's Institutes (the WI) is the UK's largest women's organisation, with over 170,000 members in England, Wales and the Islands. Since 1915 its members have campaigned to tackle issues that matter to women in their communities, with a long history of working on environmental issues, such as water pollution, litter, sustainable development, and chemical pollution.

In 2017, WI members voted to raise the alarm about the vast amounts of microplastic pollution from domestic laundry through national campaigning. Since then, the WI has worked to stem the flow of microplastic pollution through research, community action and national advocacy.

The Global Plastics Policy Centre, based at the University of Portsmouth's Revolution Plastics Institute, is an independent knowledge broker that facilitates effective plastics policy-making in government and the private sector. The Centre provides evidence-based guidance at the interface of government, businesses, citizens, and researchers, including supporting the United Nations process to develop a legally binding instrument to end plastic pollution. For more information or queries, please contact revolutionplastics@port.ac.uk.

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Forewords



Alberto Costa MP

*Chair, APPG on
Microplastics*

Since the APPG on Microplastics published its first report in 2021, scientific understanding and public awareness of microplastic pollution have continued to grow. While research into its long-term impacts is ongoing, it is clear that reducing microplastic pollution at source should be a priority.

This report is the product of the APPG's collaborative approach. Its recommendations reflect the breadth of evidence received during our inquiry and demonstrate the need for a coherent and coordinated response.

I would like to thank our APPG members, the many stakeholders who submitted evidence, the Women's Institute, and the Global Plastics Policy Centre for their valuable contributions to this important work.

I hope the Government will engage constructively with both this report and the APPG as it develops future environmental and water policy, and that these recommendations will help inform a comprehensive approach to reducing microplastic pollution and protecting our natural environment for future generations.



Prof. Vikas Kumar

*Deputy Vice-Chancellor
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This report provides a timely, robust, and evidence-based assessment of the current state of microplastic pollution in the United Kingdom, drawing on the expertise of some of the country's foremost scientists. Informed by extensive stakeholder engagement and a comprehensive review of the latest scientific evidence, it identifies critical gaps in existing policy frameworks and sets out a targeted suite of priority actions that could be implemented over the next five years. Collectively, these recommendations offer a credible pathway for the UK to adopt a precautionary, science-led approach and strengthen its position as a global leader in addressing microplastic pollution.

The University of Portsmouth's Global Plastics Policy Centre is committed to delivering independent, policy-relevant research that supports effective environmental governance and evidence-informed decision-making. This report exemplifies that commitment, combining academic excellence, analytical rigour, and practical policy insight with a clear focus on implementation and impact. It highlights a significant opportunity for the UK to take a more strategic and coordinated approach, translating the growing body of compelling scientific evidence into ambitious yet achievable policy measures that can drive meaningful environmental and societal outcomes.



Jeryl Stone

*Chair, National Federation
of Women's Institutes*

The Women's Institute has campaigned to protect our waters and stop pollution for nearly 100 years. Since launching our End Plastic Soup campaign in 2017, WI members have worked tirelessly to raise awareness of microplastic pollution and champion practical solutions in their communities and with decision-makers.

Every day new evidence sheds further light on the environmental, health and economic impacts of microplastic pollution, while public concern continues to grow. Yet action is not keeping pace with the challenge of tackling this huge tide of plastic pollution, and the government must do more to understand the issue and stop microplastic pollution before it enters our bodies, environment and further harms livelihoods.

Bringing together evidence from experts, industry, regulators and civil society, this report for the first time, provides a comprehensive assessment of the scale of microplastic pollution in the UK. It is a clarion cry for government action. We hope the APPG's findings and recommendations will drive the urgent action we need, and help us achieve a future protected from the growing impacts of microplastic pollution.



Executive Summary

This report assesses the current UK policy landscape on microplastic pollution and identifies a focused set of priority actions that can be implemented within the next five years to reduce emissions across key sources and pathways. It draws on current evidence and stakeholder input to set out practical, near-term measures that can be delivered through existing policy frameworks, while recognising the need for longer-term structural change.

Microplastics are now pervasive across environmental systems, food chains and the human body. They are routinely detected in air, water, soils and a wide range of foods, resulting in continuous human exposure through ingestion, inhalation and contact. Evidence is rapidly emerging linking microplastics and associated chemicals to a range of adverse health outcomes, including inflammation, endocrine disruption and increased risk of chronic disease. Although precise safe exposure thresholds remain uncertain, the scale, persistence and widespread nature of exposure indicate that delaying action increases the risk of cumulative and potentially irreversible impacts.

Microplastics interact with food systems by degrading soil quality, reducing crop productivity and introducing contaminants into agricultural land through pathways such as sewage sludge application. These pressures have implications for food security, particularly where soil health and ecosystem functioning are compromised. The economic implications of microplastic pollution are increasingly recognised, with emerging evidence of economic impacts across fisheries, agriculture and public health sectors, alongside growing costs associated with pollution management and environmental degradation. While uncertainties remain, the scale and persistence of exposure, combined with the difficulty of removing microplastics once released, present a clear case for precautionary action.

Despite this, the UK lacks a coherent policy response for microplastics. There are no legally defined reduction targets, no regulatory limits across key pathways such as wastewater, air or soils, and no coordinated framework to guide action. This creates uncertainty for regulators and industry, limits the ability to prioritise and fund interventions, and risks increasing long-term environmental, health and economic costs. Early intervention is likely to be significantly more cost effective than managing cumulative microplastic pollution and its downstream impacts. At the same time, regulatory transitions must be managed carefully. Reducing microplastic emissions will require changes across major sectors, and these must be delivered in a way that supports safe substitution of materials and avoids unintended harm, while also ensuring that impacts on workers, industries and communities are understood and managed.

This report identifies five priority policy areas for action.

1 Establish a clear UK policy framework with targets

The UK currently lacks a coherent framework to guide action on microplastics. A clear framework provides direction, improves coordination across departments, and enables more consistent delivery. Time-bound targets to reduce microplastic pollution and its impacts support accountability, reduce uncertainty for industry, and create the conditions for investment and innovation.

Priority actions:

- Develop a UK Microplastics Strategy or Bill with time bound reduction targets to reduce leakages, including through design requirements and reducing the volume of plastics placed on the market, and with human health protection as a specific objective.
- Establish clear cross-government leadership and coordination mechanisms for delivery, this could include a designated minister or body responsible for microplastic pollution.
- Integrate microplastic controls into existing environmental and circular economy policies such as the Plan for Water and incoming Circular Economy Growth Plan.
- Embed periodic review mechanisms to update targets and measures in line with emerging evidence, with public reporting of progress.

2 Regulate high microplastic leakage sources

A small number of sectors are responsible for a large share of microplastic leakages. Targeting key sources offers the most direct and cost-effective route to reducing emissions. Upstream controls reduce reliance on downstream treatment and create clearer signals for industry to innovate and adapt.

Priority actions:

- Mandate product design and material standards for priority sectors to reduce microplastic shedding and hazardous chemical content, supported by clear labelling requirements.
- Establish legally binding leakage reduction requirements for major microplastic sources, supported by monitoring and reporting obligations. This includes packaging, tyres, textiles, paints, agricultural products, and pellets.
- Expand bans of avoidable sources of intentionally added microplastics beyond rinse-off cosmetics to cover fertilisers, microplastic infill materials, agricultural products, industrial abrasives, detergents, paints, and chewing gum; in alignment with international approaches and EU restrictions on intentionally added microplastics under REACH.

3

Use Extended Producer Responsibility and existing economic tools to drive reduction

Current economic incentives do not sufficiently address microplastic pollution. Extended Producer Responsibility (EPR) shifts economic responsibility upstream to producers, where emissions can be most effectively reduced. It improves transparency, supports better product design, and ensures that the costs of pollution are more fairly distributed.

Priority actions:

- Extend mandatory EPR to priority microplastic-intensive sectors, focusing initially on textiles, tyres and plastic pellets, building on existing EPR frameworks.
- Define clear legal and financial producer responsibility, including requirements for traceability, reporting and accountability for tracking of material flows across the full product lifecycle.
- Mandate reporting on polymer types and plastic-associated chemicals used in all products to enable identification of key microplastic sources, improve traceability of emissions, increase public awareness, and support safer by design approaches.
- Deliver a consistent, UK-wide Deposit Return Scheme on time, with alignment across devolved administrations to maximise return rates and reduce environmental leakage.

4

Strengthen wastewater, sludge, and soil protections

Wastewater systems are a major pathway for microplastics release into the environment. Addressing key pathways reduces environmental exposure and prevents redistribution of microplastics across ecosystems. Early intervention is likely to be significantly more cost effective than managing long-term accumulation and clean-up.

Priority actions:

- Upgrade wastewater treatment infrastructure to include advanced and tertiary filtration capable of capturing smaller microplastic particles across multiple sources, not limited to fibres.
- Integrate sludge into Environmental Permitting regulations by requiring permits for treatment, storage and land application, with clear compliance and monitoring conditions.
- Set interim precautionary thresholds or risk-based limits for microplastic and plastic-associated chemicals in sludge applied to land, with a clear pathway for refinement as evidence develops. Begin with precautionary or risk-based thresholds to guide safe use while fuller standards are developed.
- Mandate microfibre capture measures for washing machines by introducing requirements for microfibre filters on new washing machines, alongside standards for performance, maintenance and disposal of filters.

5

Build a coordinated monitoring and evidence system

Effective policy is constrained by gaps in data and consistency. A coordinated system enables better risk assessment, supports enforcement, and ensures that policy remains responsive to emerging evidence. It also strengthens alignment with international approaches.

Priority actions:

- Agree and adopt clear standard definitions for micro- and nano-plastics within UK policy, aligned with international terminology to provide clarity for regulation, monitoring and enforcement.
- Establish a national monitoring framework across human health, water, sludge, soils, and air; covering water, sludge, soils and air as a first phase, with clear roles for delivery bodies. Integrate citizen science to expand coverage and public engagement.
- Harmonise sampling, analytical methods and reporting by building on the British Standards Institution (BSI) and international work to ensure consistency and comparability across datasets, while allowing for flexibility of methods where needed.
- Mandate targeted monitoring and reporting from priority sectors and pathways, supported by mandatory producer disclosure of polymer composition and additives, to improve traceability and policy relevance of data.
- Fund targeted research to address key evidence gaps to support understanding of microplastic sources, pathways, impacts and safe thresholds, aligned with national monitoring priorities and future regulatory needs.

The UK is not alone in facing this challenge, but the current pace of national action risks falling behind emerging international approaches. As other jurisdictions move to introduce targets, standards and controls across key sources and pathways, continued delay increases the likelihood of regulatory misalignment, higher future costs, and avoidable risks to public health, food systems and economic resilience. A more coordinated and forward-looking response is therefore needed to ensure the UK remains aligned with evolving evidence, protects its population and environment, demonstrates leadership, and maintains credibility in international policy development.

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1 Introduction

Microplastics are pieces of plastic between 1 micrometre and 5 millimetres in size, often originating from the breakdown or shedding of everyday plastic items such as synthetic textiles, packaging, paints, cosmetics, car tyres and more. Microplastics are also intentionally added as particles to products (Table 1). Microplastics can travel vast distances and are not limited by national boundaries and are almost impossible to remove from the environment once released¹. They are now found throughout the world² and the human body^{3,4}, and in over 1,300 species across food webs⁵, with growing evidence of harm to people and the planet.

Microplastic definitions vary across the literature and policy contexts, reflecting differences in scope, measurement approaches and intended use. For the purposes of this report, the definitions set out below (Table 1) have been adopted to ensure clarity and consistency, though the use of these definitions may change over time as research progresses. Primary and secondary microplastics are differentiated as they are both addressed differently by policy and mitigation strategies. These definitions are aligned with recent UK government evidence and analysis, including Defra's work on intentionally added microplastics⁶ and the European Union's regulations on the restriction of microplastics intentionally added to products⁷.

Table 1. Source-based categories and definitions of microplastics.

Microplastic type	Definition
All microplastics	Pieces of plastic between 1 micrometre (µm) and 5 millimetres in size ⁸ .
Primary	Primary microplastics are plastic particles that are intentionally manufactured at 5mm or less and are released into the environment as particles. These include three types: primary plastic pre-production materials, e.g. flakes, pellets and powders; primary microplastics used directly as small pieces, e.g. glitter and confetti; and, microplastics intentionally added to other materials (also known as Intentionally Added Microplastics, IAMs) e.g. microbeads in cosmetics, artificial sports pitches, paints and coatings, decorations, personal care, cleaning, and agricultural products, such as control release fertilisers.
Secondary	Secondary microplastics originate from the degradation and break up of larger plastic items that are larger than 5mm at the time of manufacture and use. This can include three types: secondary microplastics generated by wear of products during use, e.g. tires, textiles (known as microfibres), paints; secondary microplastics generated during waste management processes, e.g. during recycling; and microplastics generated by the breakdown of larger plastic products (macroplastics) in the environment due to factors such as sunlight, friction, weather and interaction with other chemicals.
Nanoplastics	Plastic particles smaller than 1 micrometres (µm), small enough to permeate through biological membranes.

Research on microplastics, their sources, and impacts, has evolved rapidly in recent years, alongside rising public concern^{9,10}. Microplastics have now been evidenced to persist in the environment to the point that they risk disrupting key Earth systems that support human health, food systems, and economic growth¹¹. Despite this, policy responses in the UK remain limited and fragmented, with no coordinated framework, targets, or regulatory limits addressing microplastic releases across key sources. Leading microplastics scientists across the UK are calling for urgent government intervention through a more coordinated national response¹².

In response, the UK Parliament's All-Party Parliamentary Group on Microplastics (The Group) launched its second inquiry¹³ in 2026 to provide an updated assessment of microplastic pollution in the UK. The inquiry aimed to capture current evidence on sources, risks and impacts, and to identify practical, evidence-based actions for government.

TACKLING MICROPLASTIC POLLUTION IN THE UK

Introduction

The Group issued an open call for evidence between November 2025 and March 2026, receiving submissions from thirty-six organisations. Contributors included academic institutions, water companies, trade associations, industry representatives, and environmental organisations. The Group partnered with the University of Portsmouth's Global Plastics Policy Centre to support independent, evidence-based analysis, policy evaluation and report writing. More detail on the methods used can be found in Appendix 1.

This report synthesises a wide range of stakeholder perspectives into a structured assessment of current policy gaps and opportunities for action. It reflects areas of convergence across sectors and translates these into a set of prioritised, near-term actions alongside longer-term considerations. A key outcome of the inquiry is the identification of immediate policy actions, to occur in a five-year window, supported by a longer-term roadmap to guide sustained reduction in microplastic pollution.

The report first outlines the scale and nature of microplastic pollution, including its sources, pathways and impacts across human health, the environment, the economy and food systems. It then reviews current UK responses, covering existing government action alongside wider non-government and citizen-led initiatives. From the consultations conducted, the report sets out five priority areas for policy action, each supported by targeted recommendations for the next five years. Supporting material, including methods, identified knowledge gaps, and sector-specific approaches, is provided in the appendices.



Photo © Sol Vazquez Cantero

2 Scale and urgency of microplastic pollution

The scale and complexity of microplastic pollution is increasing, driven by rising plastic production and the fragmentation of larger plastic objects and materials across the environment. Global plastic production more than doubled between 2000 and 2025, from 234 million tonnes (Mt) to 450 Mt in 2025, and it is expected to reach 736 Mt by 2040¹⁴. There is a direct correlation between plastic production and plastic pollution¹⁵. Global releases of microplastics to the environment, currently estimated at 10 to 40 Mt annually¹⁶, are projected to double by 2040, under business-as-usual conditions¹⁷. Microplastics are already found in nearly all ecosystems, from deep sea sediments to polar ice¹⁸⁻²², and throughout the human body²³. Leakages occur across the entire life cycle of plastics (Figure 1), from production and everyday use to disposal and recycling^{24,25}.

Once released into the environment, microplastics become difficult to track, as many factors affect their dispersal behaviour. How they travel can depend on aspects such as their density, size, shape, whether they have been colonised by microbes, as well as weather and water conditions including temperature, turbulence and salinity²⁶⁻²⁹. Microplastics' travel behaviour can change as plastics continue to fragment and become smaller over time. This continual degradation means existing plastics and microplastics in the environment and human bodies present an ongoing exposure threat, where microplastics constantly increase in number, becoming even more difficult to remove the smaller they get. Microplastics also have a lifespan ranging from decades to thousands of years³⁰, meaning their persistence creates a state of almost permanent contamination³¹. Though technology is in development to remove and degrade microplastics^{32,33}, the complexity of their diversity, persistence and widespread dispersal in the environment suggests prevention should be prioritised over clean-up.

Microplastic pollution poses ongoing risks to biodiversity, ecological functioning, ecosystem services, health and food security^{34,35} (see Section 4). Over 16,000 chemicals have been identified in plastics, 26% are known to be hazardous, while the majority have never undergone safety testing³⁶. These chemicals, which can leach into food, soil, water and human tissues, especially through microplastics, include known carcinogens and endocrine-disrupting chemicals³⁷. Exposure has been associated with cancer, impaired neurodevelopment, reproductive disorders, metabolic disorders, infertility, obesity, cardiovascular and renal disease^{38,39}. Yet only 6% of these chemicals are currently regulated⁴⁰.

This is relevant in the UK, where public awareness and concern are increasing. A national YouGov survey found that plastic pollution is perceived as one of the top three threats to society, alongside war and climate change⁴¹. Public support for action is also strong with a UK based survey finding 70% of participants supported regulation of microplastic polluting industries and 69% support banning plastic items most likely to become pollution^{42,43}. A recent focus of public concern is exposure to microplastics and plastics-associated chemicals during the first 1,000 days of life (from conception to age two), highlighted during a recent National Emergency Briefing in the House of Lords⁴⁴.

The UK lacks a roadmap to reduce microplastic pollution, despite the growing evidence base and public concern. The UK has no legal targets, no limits and no timelines for reducing microplastic pollution. Though a ban on plastic wet wipes is due to come into force in 2027⁴⁵, the only regulation to specifically address microplastics is the 2017 ban on microbeads in cosmetics, which addresses less than 5% of the microplastics entering the environment⁴⁶. Though microplastics are mentioned as a concern in some national strategies and policies, lessons and recommendations from the scientific community are not being systematically integrated into policy or regulation⁴⁷. The UK risks falling behind other leading nations, where action is being taken internationally. The EU has introduced measures to reduce microplastic leakages from sources such as artificial turf and paint⁴⁸, alongside limits on microplastic discharges in wastewater⁴⁹. France has legislated for microfibre filters on new washing machines⁵⁰, and the US state of California has established requirements for monitoring microplastic contamination in drinking water⁵¹.

Urgent action is needed. The current lack of a clear policy framework in the UK is creating uncertainty for industry and the public and may complicate alignment with trading partners and regional regulatory developments. Opportunities to address microplastics through emerging policy areas, including circular economy initiatives, are not being fully realised. A more coordinated and comprehensive approach would provide greater clarity on direction and priorities, and this document sets out an initial basis for that approach.

TACKLING MICROPLASTIC POLLUTION IN THE UK

Scale and urgency of microplastic pollution

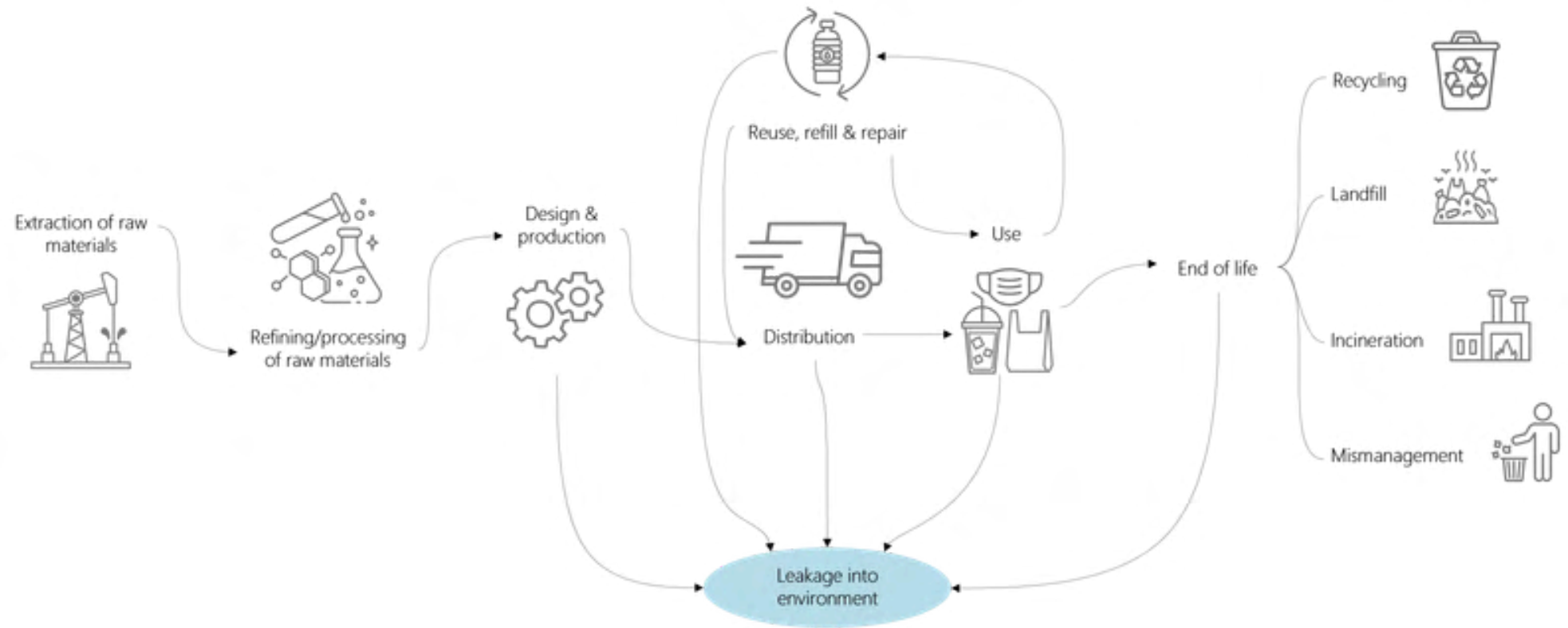


Figure 1. *Plastics Life Cycle.* Source: Global Plastics Policy Centre.

3

Where do microplastics come from?

Microplastic pollution arises from a wide range of sectors and pathways across the plastics lifecycle. This section synthesises the evidence submitted to the inquiry, alongside supporting scientific literature, to identify the principal sources of microplastic pollution and the most significant opportunities for intervention.

3.1 Packaging

Despite the UK having a tax and extended producer responsibility (EPR) regulations for plastic packaging, it remains a major source of microplastic pollution due to mismanagement, high volume, short time span and propensity to fragment in the environment. Once discarded, packaging materials degrade through exposure to sunlight, abrasion, and weathering, generating secondary microplastics that persist across terrestrial and aquatic systems. Research has found that plastic packaging dominates UK litter, with 71.3% of all recorded litter being plastic⁵². Further releases occur through failures in the UK's waste management systems including landfill leakage, mechanical recycling processes and plastic waste exports^{53,54}. In the UK, nearly 82 billion pieces of plastic packaging are discarded each year⁵⁵, the second highest rate of plastic waste per person in the world⁵⁶, making packaging a dominant contributor to plastic waste flows. Packaging for food and drink (food contact items) also represent a direct exposure pathway, as plastic food contact materials can release microplastics into food and beverages⁵⁷⁻⁶⁰. Further, plastic materials are not inert, meaning chemicals within the plastics can migrate from plastic food contact materials into food during normal and intended use⁶¹. Current regulatory frameworks do not require any testing for the migration of microplastics and associated chemicals from packaging into foods⁶². This particularly applies to processed foods, of which 90% come wrapped in plastic packaging⁶³.

3.2 Tyres

Tyre wear particles, primarily composed of synthetic rubber polymers, are a significant yet largely unregulated source of microplastic pollution into air, roadside soils, and waterways⁶⁴. Tyre abrasion is estimated to release up to 6 million tonnes globally each year⁶⁵. These particles are transported through road runoff, wind dispersal and drainage systems, ultimately accumulating in freshwater, marine and terrestrial environments. In addition to the particles themselves, tyre wear contains a complex mixture of chemical additives that can pose additional risks to ecosystems and potentially human health.

3.3 Synthetic textiles

Synthetic textiles, from clothes to furnishing to soft toys more, are consistently identified as one of the largest global contributors to microplastic pollution, primarily through the release of synthetic microfibres during production, use, and disposal. Estimates vary, but suggest around 211,000 tonnes of microfibres enter the marine environment each year⁶⁶, with projections estimating this could reach 22 million tonnes cumulatively by 2050⁶⁷. Laundry effluent alone accounts for over one-third of microplastic releases to the world's oceans⁶⁸.

Releases occur across the textile lifecycle, including during manufacturing, laundering, wearing and drying, and through the breakdown of discarded textiles⁶⁹⁻⁷¹. These leakages arise not only from clothing, but also from a wide range of everyday items such as furniture, carpets, curtains, blankets and children's soft toys. As fibres are shed from these products, they enter wastewater systems, are released into the air, and accumulate in soils and aquatic environments, leading to widespread contamination.

3.4 Paints

Though the evidence base is growing, research estimates paints and coatings to be a significant source of microplastic pollution. Paints and coatings use liquid polymer-based binders that, after drying, fix a colour onto a painted surface, creating a thin film, which then degrades under environmental conditions, such as temperature changes, to become a source of microplastics⁷². These coatings also contain additives, including heavy metals used for colour, which can be released alongside microplastic particles or become adsorbed, forming a thin film around the outside of other microplastics⁷³. Paints contribute a global average leakage of 1.3 million tonnes of microplastics each year⁷⁴, making them one of the most prevalent quantified sources. On land, paint pollution comes from coatings on roads, cars, buildings and infrastructure, with particles transported through urban runoff, wastewater, and the air as airborne particles. In aquatic and marine environments, paint fragments come from the breakdown of coatings on vessels and maritime infrastructure such as piers⁷⁵. Despite their estimated scale, paint-derived microplastics remain relatively under-researched compared to other major sources⁷⁶.

3.5 Pellets or nurdles

Pellets, or nurdles, are small pieces of plastic, either virgin or recycled, used as the raw material for most plastic products. Pellets can enter the environment at various points across the supply chain, including through accidental spillage during land or sea transport, handling losses, improper use as packaging materials, and direct discharge from production and processing facilities⁷⁷. Globally, pellet loss is estimated to contribute around 254,000 tonnes of microplastic pollution each year⁷⁸. In the UK, pellet use is widespread, with over 5,800 businesses and facilities handling these materials. As a result, pellet pollution is found across the country, with estimates suggesting that over 1,000 tonnes of plastic pellets (53 billion individual pellets) spill into the environment annually⁷⁹⁻⁸⁴.



Photo © Miguel Malo

3.6 Wastewater, sewage sludge, and biosolids system

One UK based study recorded over 48 billion microplastics per day entering just three sewer networks, prior to treatment. Microplastics enter wastewater systems through multiple sources from industrial and domestic discharges, through runoff from roads, farms and urban environments, from mismanaged waste such as litter, and even from airborne microplastics. Microfibres, primarily from domestic and industrial laundry, are a large source of microplastics in wastewater (see Section 3.3) and account for 89 to 97% of microplastics in sludge⁸⁵. Treatment processes can be a source of microplastic pollution from their use of intentionally added bio-beads, which have been shown to escape into the environment through operational failures. Treatment plants in the UK are estimated to use billions of these bio-beads within their filtration systems and risk major leakages such as the estimated leak of up to 10 tonnes of bio-beads from a Southern Water treatment plant which washed up on Camber Sands beach UK, in November 2025.

Treatment processes can remove up to 99% (by number; up to 25 µm in size⁸⁶) of microplastics from wastewater, however, these are then largely transferred into sewage sludge⁸⁷, with Defra reporting retention of more than 99% of microplastics larger than 25 µm in sewage sludge⁸⁸. As such, wastewater treatment plants themselves can act as a pathway for microplastics emissions, releasing them through treated sewage (known as biosolids), and untreated sewage sludge, where effluent is released in storm overflow events. During extreme rain events it is estimated that between 1% and 15% of wastewater can overflow, resulting in untreated sewage being discharged directly into the environment⁸⁹. In 2024 in the UK there were approximately 591 thousand spill events of untreated sewage^{90,91}. Untreated sewage can also contain pathogens attached to microplastics, including antimicrobial resistant organisms⁹².

As a result, sewage sludge is a major pathway for microplastic contamination of soils^{93,94}. In the UK, between 87 to 94% of the 3.6 million tonnes of sewage sludge produced annually is applied to agricultural farmland as fertiliser⁹⁵. A 25-year study found microplastic concentrations in soils increased 723 to 1445% after just four years of repeated sludge application⁹⁶.

3.7 Agriplastics

Agriplastics are widely used in UK agriculture including mulch films, protective nets, polytunnels, irrigation systems, coatings for agrochemicals and seeds (that are designed to fragment in the environment over time), as well as packaging. These materials are typically lightweight and prone to fragmentation during use, removal and disposal, leading to direct accumulation of microplastics in soils⁹⁷. In many cases, incomplete retrieval or mechanical degradation results in plastics being left in fields or ploughed into soils. Additional inputs arise from contaminated composts and sewage sludge (see Section 3.6), further increasing microplastic loads. Once in soils, these particles can persist and accumulate over time, with limited removal pathways, raising concerns for soil health, crop productivity, and potential transfer into food systems.

3.8 Bioplastics

Bioplastics encompass a diverse group of materials and may be bio-based, biodegradable, or both. The terms "bio-based" and "biodegradable" describe different attributes of plastics, namely their feedstock origin and their end-of-life fate. Bio-based plastics are made either wholly or partly from natural materials. Biodegradable plastics are designed to break down through the action of microorganisms under specified conditions. These characteristics are not synonymous. Some bio-based plastics are not biodegradable; while some biodegradable plastics are made from fossil fuel feedstocks⁹⁸. Where plastics are biodegradable, degradation depends on the material type and the environmental conditions, with many materials requiring industrial composting facilities rather than degrading readily in natural environments.

Oxo-biodegradable plastics are often included in the category of bioplastics, but are distinct from biodegradable plastics. Oxo-biodegradable plastics are fossil fuel derived plastics that contain additives, such as metal salts, that accelerate breakdown or fragmentation in the environment. This is not the same as a natural biodegradable process, which involves microorganisms breaking materials down into natural substances such as carbon dioxide, biomass and water. Oxo-biodegradable plastics can increase the generation of microplastic fragments⁹⁹, and as a result their use has been restricted in several jurisdictions including the EU and Canada^{100,101}. An evidence review by the Welsh government found the use of oxo-biodegradable plastics would undermine circular economy objectives and suggested their use should be restricted¹⁰².

Although some bioplastics have been promoted as alternatives to conventional plastics, evidence indicates that biodegradation performance varies considerably between materials and environmental conditions. Several biodegradable plastics do not readily degrade in soils, freshwater or marine environments, where they may persist, fragment or continue contributing to plastic pollution¹⁰³⁻¹⁰⁶. This highlights the importance of evaluating alternative materials according to their full life cycle, environmental fate and intended end-of-life management.

3.9 Synthetic turf

Synthetic or 'astro' turf (grass pile, shock pads, infill and rubber crumb) is a significant source of microplastic pollution, particularly in urban home, recreational, and sports settings. Abrasion, weathering and routine use lead to the release of plastic particles and rubber crumb, which are transported via runoff, drainage systems and air into surrounding environments¹⁰⁷. European evidence identifies artificial sports pitches as the largest source of intentionally added microplastics pollution, accounting for approximately 38% of releases when pellets are excluded¹⁰⁸. In the UK there are approximately 9,747 artificial sports pitches¹⁰⁹⁻¹¹², that are public and privately owned, found in schools, community centres and sports facilities, with the government planning to develop 991 more sports artificial pitches across the UK¹¹³.



Photo © Raymond Davies

3.10 Recycling processes

Recycling processes are an under-recognised source of microplastic releases. Mechanical recycling activities such as sorting, shredding, washing and reprocessing can generate plastic fragments and fibres, which may be released into air, wastewater and residual waste streams if not effectively captured¹¹⁴⁻¹¹⁶. The scale of these releases remains poorly quantified, particularly across different facility types and operating standards. Where waste is exported for recycling, weaker environmental controls can further increase the risk of microplastic release during handling and processing¹¹⁷⁻¹¹⁸. These processes also present exposure risks for workers and nearby communities, particularly through inhalation of airborne particles and contact with contaminated dust and wastewater. This highlights a gap in current policy approaches, where recycling is promoted as a solution, but its potential contribution to microplastic pollution is not yet systematically addressed or monitored.

3.11 Other sources

The following sources are less consistently quantified but contribute to cumulative microplastic pollution across multiple pathways:

- medical equipment, including invasive medical devices such as catheters and implants¹¹⁹,
- chewing gum^{120,121},
- children's toys¹²²,
- fireworks¹²³,
- incineration and open burning of plastics¹²⁴,
- maritime waste disposal from ships/infrastructure, fishing and aquaculture gear loss¹²⁵, and
- runoff from roads, storms and urban areas¹²⁶.



Photo © James Wakibia

4 What are the impacts of microplastics?

Microplastics are now present across all environmental systems and exposure pathways, resulting in a wide range of complex and interconnected impacts on human health, ecosystems, the economy and food systems. These impacts arise from both the presence of the microplastic particles and from the chemicals they contain and transport, with effects observed across multiple scales and systems. Respondents to the call to evidence highlighted that although the evidence base for the harmful impacts of microplastics is still growing, and not always fully conclusive, there is enough evidence at present to suggest we follow precautionary principles and act now.

4.1 Human health impacts

The potential health hazards associated with microplastics come in three forms: the physical particles themselves, the associated chemicals, and contaminants adsorbed from the environment such as metals, persistent organic pollutants (POPs), microbial pathogens and biofilms¹²⁷. Individual exposures and associated risks to health differ depending on many factors including age, health, diet, lifestyle choices, occupation, location, and socioeconomic background. As such, the likelihood of harm occurring on an individual level, and the severity, based on how much, how often, and in what way a person is exposed, is challenging to estimate¹²⁸. However, research has found that plastics exposure can contribute to higher incidence of disease and death¹²⁹. Despite this, causal links and the exact mechanisms that cause harm require further research. For example, the degree to which harm is caused by the physical particle itself, versus the release of the many potentially toxic chemicals and additives they contain or absorb, or a combination of both, is not yet known¹³⁰. Research that examines the direct impacts of microplastics on human health is a fairly new area, with evidence fast emerging that exposure is potentially harmful. To read more about research gaps, see Appendix 2.

How do microplastics enter the human body?

Microplastics enter the human body through food and drink.

Microplastics have been documented in a wide array of food items, including meat¹³¹, fish, fruits, vegetables, salt, milk¹³², and drinking water¹³³. Estimated annual intake in high income countries (such as the UK) from food alone ranges from 39,000 to 52,000 particles per person^{134,135}, with seafood identified as a particularly significant source of exposure¹³⁶. Agricultural practices contribute to ingestion pathways, since microplastics in sewage sludge¹³⁷ and fertilisers¹³⁸ enter soils and food chains. Food-contact plastics provide a direct exposure route, with plastics releasing particles into food during processing and use¹³⁹. Chewing gum is another source, with synthetic plastic gum releasing more than 250,000 microplastic particles upon chewing, most within the first eight minutes^{140,141}.



Photo © Maya Holt

Microplastics are inhaled through indoor and outdoor air.

Inhalation is recognised as an important but under-researched exposure pathway^{142,143}. Indoor environments are a key source, with leakages from synthetic textiles (including clothes, bedding, towels), furniture, construction materials, carpets and soft toys¹⁴⁴. Carpets contribute significantly, with individuals whose homes are furnished with synthetic carpets estimated to inhale between 2,000 and 7,000 microplastic particles per day¹⁴⁵. Recent evidence suggests adults inhale up to 68,000 plastic particles sized 1–10 micrometres daily from indoor air, approximately 100 times higher than prior estimates¹⁴⁶. Toddlers inhale twice as many microplastics per kilogram of body weight per day as adults due to their faster breathing rate¹⁴⁷ raising concerns about developmental exposure and increased biological vulnerability. Microplastics have been shown to embed in lung tissue, cross cellular barriers and enter the bloodstream¹⁴⁸. Modelling of outdoor air quality suggests that most airborne microplastics originate from roads (84%), with smaller contributions from the ocean (11%) and agricultural soils (5%)¹⁴⁹. Additional sources can include soil and road dust, suspended particles from urban environments, waste incineration, landfills and recycling plants, and industrial exhaust, and their airborne transport varies depending on many factors including the weather and landscape typography¹⁵⁰.

Microplastics can be absorbed through direct contact with skin.

Dermal exposure occurs through contact with synthetic textile microfibres, and personal care products^{151,152}. Microplastics in the air also contribute to dermal exposure, particularly in environments, such as the home, with high concentrations of airborne microplastics¹⁵³. Transfer through or penetration of the skin is likely only through dermal exposure to nanoplastics which measure less than 1 micrometer in size, but microplastics can still act as carriers for chemicals that can be absorbed through the skin¹⁵⁴⁻¹⁵⁶.

How do microplastics impact our health?

Microplastics have been detected throughout the human body and are known to accumulate in tissues and organs.

Although scientific evidence on the potential health impacts of microplastic particles in the human body has expanded considerably, the field remains in its early stages and lacks standardised methodologies relating to exposure, detection, and quantification¹⁵⁷, see Appendix 2. Current knowledge is derived from a range of research approaches, including clinical studies, postmortem analyses, in vivo studies (conducted within a living organism) and in vitro laboratory studies. Each of these contributes distinct insights but may also have inherent limitations. For example, the concentrations of microplastics used in experiments may be greater than real world environmental exposures; at the same time, we do not know what impacts long term, chronic exposures to lower levels of microplastics have on human health. Further research is needed to clarify the causation pathways and direct impacts on human health.

Clinical studies have confirmed the presence of microplastics in human blood¹⁵⁸ demonstrating systemic exposure, and in placental tissue¹⁵⁹ raising concerns of potential impacts of microplastics during pregnancy. Microplastics have been identified in kidney tissue¹⁶⁰ and post-mortem (autopsy) studies have identified microplastics in human lung tissues¹⁶¹, providing direct evidence of accumulation within respiratory organs. In vivo studies, primarily conducted using animal models such as mice, show that microplastics can be transported throughout the body and accumulate in organs including the liver¹⁶² and spleen¹⁶³ as well as showing that microplastics cross biological barriers including the blood-brain barrier¹⁶⁴.



Photo © Beth Fitzpatrick

Microplastics are associated with a range of adverse health outcomes.

In vitro cell-based and in vivo animal studies indicate that microplastics that accumulate in organs can exert toxic effects^{165,166}. Studies demonstrate that microplastics may damage tissues and disrupt gut microbiota composition¹⁶⁷, and induce cellular damage through mechanisms such as oxidative stress and inflammation¹⁶⁸. Research has also linked microplastic exposure to negative health outcomes including infertility¹⁶⁹, premature birth¹⁷⁰, miscarriage¹⁷¹, foetal growth restriction and long-term neurodevelopmental impairment¹⁷². Additionally, laboratory research suggests associations with neurodevelopmental and neurodegenerative conditions, including Alzheimer's disease¹⁷³⁻¹⁷⁵.

Moving from laboratory studies described above, clinical evidence remains even more limited; clinical studies have identified potential associations between microplastic and nanoplastic exposure and disease. For example, one clinical study reported that the presence of microplastics or nanoplastics within carotid artery plaques was associated with an increased risk of stroke, myocardial infarction, and mortality. However, association does not establish causation¹⁷⁶. There is a clear need for further research into the impacts of microplastics on human health.

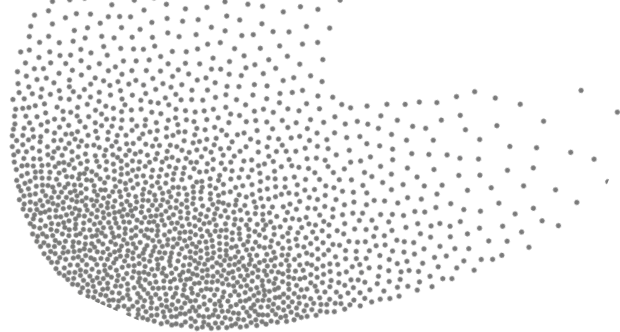
Exposure to chemicals contained within or carried by microplastics represents a major and under-assessed health risk.

Over 16,000 plastic-associated chemicals are currently used in plastic production. 4,200 of these have been identified as chemicals of concern, and include known carcinogens and endocrine disruptors. Yet the vast majority of plastics-associated chemicals have never undergone safety testing, and we simply do not know whether or not they are hazardous to health¹⁷⁷. Plastic-associated chemicals are released into the environment via leaching, abrasion or ingestion¹⁷⁸. Exposure to these chemicals is associated with impaired neurodevelopment, infertility, obesity, cardiovascular and renal disease and cancer¹⁷⁹. Risks are potentially higher during pregnancy and childhood. The Minderoo-Monaco Commission on Plastic and Human Health¹⁸⁰ identified children as among the populations at highest risk of plastic-related health effects. This is owing to the increased biological vulnerabilities of infants and children to hazardous chemicals and children's unique exposure pathways. Exposures to plastic-associated chemicals during pregnancy and early life are linked to increased risks of premature birth, stillbirth, low birth weight, congenital anomalies including reproductive organ defects, impaired lung development, and neurodevelopmental disorders such as autism and attention-deficit/hyperactivity disorder (ADHD). Evidence also suggests that early-life exposure to plastic-associated chemicals may elevate the risk of childhood cancer and multiple non-communicable diseases later in life¹⁸¹.

Microplastics act as carriers for other harmful substances and pathogens. Microplastics can transport a wide range of contaminants, including heavy metals^{182,183}, bacteria, viruses and fungi, persistent organic pollutants, and antibiotics, facilitating their movement through ecosystems and into human exposure pathways^{184,185}. Microplastics provide surfaces for microbial colonisation and promote the formation biofilms, which can harbour and spread drug-resistant bacteria¹⁸⁶ and contributing to antimicrobial resistance, a critical global public health threat¹⁸⁷.



Photo © Kamitana Studio



4.2 Food system impacts

Microplastics are entering food systems through multiple pathways, increasing exposure risks for humans and livestock.

Evidence shows that microplastics move through soils, water and organisms, accumulating along food chains and introducing both particles and associated chemicals and contaminants into plant tissues, food and diets¹⁸⁸⁻¹⁹¹.

Agricultural practices are a key entry point for microplastics into food systems.

Sewage sludge, composts, mulching, agriplastics and fertilisers introduce microplastics directly into soils, while airborne deposition and road runoff add further contamination¹⁹²⁻¹⁹⁶. Plastics, however, are integral to industrialised farming systems and support food production and lower costs by improving crop yields, extending growing seasons and locations, reducing labour, improving nitrogen use efficiency and reducing nitrogen losses, reducing evaporation and improving water use efficiency, protecting crops, and supporting storage and other farm operations¹⁹⁷⁻²⁰².

Contamination of agricultural soils translates into risks for food production and safety.

Microplastics can inhibit photosynthesis and compromise soil health, and microplastic contamination of soil is projected to lower future food production^{203,204} (See Section 4.6 on Soil health impacts). Microplastics act as carriers for hazardous substances, including heavy metals, persistent pollutants and antimicrobial resistant organisms, compounding risks to food quality²⁰⁵⁻²⁰⁷. Microplastic pollution poses a risk for those consuming contaminated food but also an increased health risk for those working on farms²⁰⁸.

Evidence indicates that UK food production systems are already exposed to increasing microplastic contamination. UK agricultural soils have been identified as among the most contaminated in Europe, with significant increases linked to repeated sludge application, with 500 to 1,000 microplastic particles applied per square metre each year²⁰⁹. A UK based study showed an increase in microplastic levels of 723-1445% in soil samples after just four years of repeated sludge application²¹⁰. Microplastic contamination of agricultural land raises concerns for long-term productivity, food safety and regulatory oversight.

Food processing, packaging and preparation introduce additional and direct exposure pathways.

In the UK, an estimated 70% of food and drink items are packaged in plastic²¹¹. Everyday household and commercial practices further introduce particles, including those shed from plastic chopping boards, which can release up to 300 microplastic particles per cut²¹², and plastic containers used for takeaways or microwave heating²¹³. Routine actions such as opening or closing plastic water bottles release approximately 550 particles each time due to abrasion between the cap and bottleneck²¹⁴.

There is growing public and agricultural sector concern in the UK regarding microplastic contamination in food systems.

Public and farmer surveys highlight substantial concern regarding microplastic contamination in the food system. A national poll of the public showed that 61% of respondents were unaware that sewage sludge is commonly used in UK agriculture, while half believed the practice poses risks to human health and food quality²¹⁵. Around 62% viewed sewage sludge use as a threat to water health, and 50% identified risks to food quality and personal health. Furthermore, a survey of UK farmers revealed widespread awareness of contamination risks from sewage sludge, with 83% recognising the threat posed by biosolids; 72% expressed worry about the implications for water health, and 69% were worried about impacts on soil health, including 41% who were very or extremely worried²¹⁶. These survey results reveal growing concern of microplastics in food production systems and highlight increasing pressure for clearer guidance and regulation.



4.3 Economic impacts

Plastic pollution generates significant but under-quantified economic costs.

The harms associated with microplastic and plastic-associated chemicals during plastic production, use and disposal impose costs across health systems, ecosystems and economic activity, including illness, lost productivity and environmental damage²¹⁷. Despite growing concern, there remains limited empirical data on the economic cost of microplastic contamination in the UK, with gaps in evidence linking environmental exposures to long-term health and economic outcomes.

Plastic pollution creates substantial environmental and sectoral economic losses.

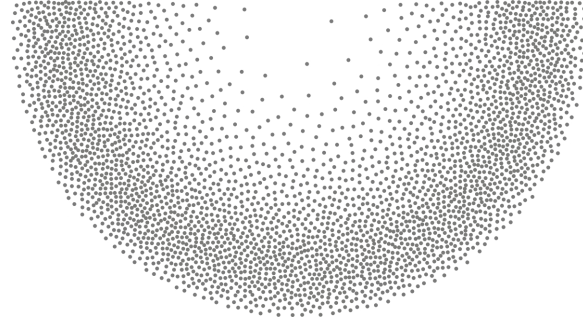
Marine plastic pollution alone is estimated to generate natural capital losses ranging from £2,446²¹⁸ to £24,468²¹⁹ per ton of plastic waste each year, indicating large externalities that are not reflected in market prices²²⁰. At a systems level, plastic production emits 1.96 Gt CO₂e annually, which has a social cost estimate of £253 billion²²¹ in climate related damages per year²²². Sectoral evidence underscores these risks. In the UK, microplastic contamination is estimated to cost the Channel oyster industry between £1.5 million to £500 million, highlighting how microplastic contamination can undermine fisheries and aquaculture value chains as well as consumer confidence²²³. In agriculture, emerging evidence indicates that microplastics can reduce crop yields, with estimated global production losses ranging from 0.4% to 34.7% annually, equivalent to economic losses of approximately £34.5 billion²²⁴ per year²²⁵.

Health impacts of plastics translate into large economic burdens.

Exposure to plastic-associated chemicals is linked to substantial economic costs through increased morbidity, mortality and lost productivity. The health impacts of just three chemicals, bisphenol A (BPA), polybrominated diphenyl ethers (PBDE), and di(2-ethylhexyl) phthalate (DEHP), have been estimated to result in £1.112 trillion²²⁶ in economic losses across 38 countries in 2015²²⁷. Broader assessments suggest plastic-related health impacts exceed £1.112 trillion²²⁸ annually²²⁹. In the United States alone, these impacts account for an estimated 1.22% of GDP, illustrating the scale of potential economic burden where exposures remain unaddressed²³⁰.

Microplastic pollution drives ongoing public expenditure through waste and clean-up costs.

Microplastic pollution via pellet spills impose immediate and often repeated public expenditure through emergency response and cleanup operations. The 2025 bio-bead spill on Camber Sands beach (UK) cost £2 million for initial cleanup²³¹. This illustrates how acute incidents rapidly become significant costs for local authorities and agencies even before accounting for long-term environmental damages or litigation costs. A recent vessel collision in the Port of Tyne resulted in the release of 25 tonnes of plastic pellets into the North Sea; the clean up costs are yet to be quantified²³². Beyond acute events, mismanaged waste and littering create persistent sources of microplastic pollution, increasing long term costs.



4.4 Climate impacts

Plastic production and microplastics contribute to climate change and can disrupt key Earth system processes.

The plastics lifecycle is a significant source of greenhouse gas emissions, accounting for 4 to 5% of global emissions, with around 90% linked to fossil fuel extraction and conversion^{233,234}. Emissions are projected to triple by 2050, with plastics potentially becoming the third largest source of greenhouse gas emissions globally by 2040²³⁵. As plastics fragment and degrade into microplastics greenhouse gases such as methane and ethylene are released²³⁶, further contributing to climate risk.

Microplastics may further intensify climate impacts through disruption of natural systems essential to ecosystem stability.

In polar regions, microplastics accelerate ice melt, while climate driven ice loss releases additional trapped microplastic particles, creating a reinforcing feedback loop that increases warming²³⁷. Microplastics disrupt the marine carbon cycle by impairing plankton populations²³⁸, reducing oceanic carbon uptake and oxygen production^{239,240}. Modelling indicates that as a result of microplastic pollution, reductions in ocean carbon export could be 7–13 million tonnes per year²⁴¹. Slower sinking organic matter due to microplastic contamination may also further compromise oceanic carbon sequestration capacity²⁴².

4.5 Water quality implications

Microplastics are an emerging pressure on fresh water quality.

Their widespread presence in rivers, lakes and coastal waters creates a persistent form of contamination that is not captured by most current water quality standards, which focus on dissolved chemicals rather than particulate pollutants²⁴³. Freshwater systems receive and retain microplastics from land-based sources, particularly through run-off from sewage sludge applied as fertiliser, with up to 99% of microplastics in sewage sludge entering aquatic ecosystems²⁴⁴. Once in river systems, microplastics accumulate in sediments²⁴⁵ with evidence of increasing levels of deposition over time in UK riverbeds²⁴⁶. Their persistence means they can remain in aquatic environments for long periods, increasing exposure of aquatic organisms and acting as carriers for other contaminants. Their small size makes them difficult to detect and remove, and treatment processes may not fully prevent their release into receiving waters. This creates long term pressures on freshwater ecosystems and raises questions about potential implications for drinking water quality and human exposure²⁴⁷. It also highlights a gap in how water quality is currently defined, measured and regulated²⁴⁸.



Photo © Andrei310



4.6 Soil health impacts

Microplastics are altering soil systems with risks of reducing soil quality and agricultural productivity.

Microplastics and their chemicals alter soil properties such as pH, water holding capacity, carbon cycling, microbial community structure and ecosystem functioning²⁴⁹⁻²⁵¹. Sewage sludge applications to land introduce harmful levels of microplastics that can jeopardise 95% of soil biota under current management practices²⁵². The changes can disrupt carbon and nutrient cycling, water retention, plant water and nutrient uptake, and photosynthesis, collectively threatening soil fertility, crop productivity and wider ecosystem health²⁵³⁻²⁶⁴. Essential soil organisms are also affected. Earthworms, which play a disproportionately beneficial role in maintaining soil structure, nutrient cycling and decomposition²⁶⁵⁻²⁶⁷, have been shown to experience reduced growth and reproduction, increasing mortality, oxidative stress and tissue damage²⁶⁸⁻²⁷¹. Such changes have implications beyond soil health, with the potential to reduce agricultural productivity and contribute to wider risks for food systems (see Section 4.7).

4.7 Wildlife health impacts

Microplastics are causing widespread harm to wildlife across ecosystems.

Microplastics have been detected in more than 1,300 aquatic and terrestrial species²⁷², with documented impacts including reproductive impairment, oxidative stress, reduced growth, altered feeding behaviour and diminished survival^{273,274}. Seabirds often ingest microplastics that resemble prey, leading to starvation, malnutrition, ulceration and death, as well as impaired nutrient absorption and disrupted chick development²⁷⁵. Nesting environments for marine turtles are also at risk, with microplastic accumulation likely to affect incubation conditions²⁷⁶.

Both microplastic particles and their chemicals disrupt biological function and population stability.

Toxic chemicals associated with microplastics interfere with hormonal processes, reproduction and development²⁷⁷, while particles themselves can obstruct digestive surfaces, diminish energy uptake, penetrate cells and induce chemical toxicity, collectively reducing food intake, growth and survival²⁷⁸. Microplastics also act as vectors for pollutants, bacterial and viral communities, increasing respiration rates and imposing physiological stress on marine filter feeders such as the native oyster *Ostrea edulis*²⁷⁹ which may diminish populations both wild and farmed (see Section 4.6 on food system impacts). In the UK's North Sea, 63% of shrimp contain synthetic microplastic fibres, and ingestion occurs across all trophic levels, including seabirds, turtles, cetaceans, plankton and fish²⁸⁰. This exposure is associated with impaired feeding, reduced growth and reproductive risks, while associated chemicals introduce additional toxicity affecting both microorganisms and higher trophic species consumed by humans²⁸¹⁻²⁸⁴.



5 Current UK policy responses to microplastics

UK policy responses to address microplastic pollution and associated impacts are fragmented, with no overarching framework or targets to guide action.

The call for evidence identified the following policies, plans and strategies as acknowledging microplastics but without any clear policy direction (Table 2), they included the Plan for Water²⁸⁵, the River Basin Management Plan²⁸⁶, the Environmental Improvement Plan, and the 25 Year Environment Plan²⁸⁷. There are no legally defined reduction targets, timelines or accountable delivery mechanisms specifically for microplastics. As a result, action is dispersed across departments and policy areas, limiting coordination and making it difficult to prioritise interventions or track progress. For example, The Plan for Water (2023) acknowledges microplastics as impacting water systems, but only offers limited and indirect interventions, such as expressing only an expectation to develop washing-machine microfibre filters rather than a requirement²⁸⁸.

A body of research into effective policy, regulation, and monitoring methods does exist, but has not yet been implemented. For example, Defra has conducted an option appraisal for reducing intentionally added microplastics, including restrictions, containment measures, and reductions in sewage sludge recycled to land²⁸⁹, but these remain policy options and have not yet been enacted. The appraisal demonstrates that potential interventions have already been identified and assessed, but also highlights the implementation challenge, that the most comprehensive restrictions estimated to deliver the greatest reductions are also the most expensive, whereas narrower containment options may be lower cost but address only parts of the problem. This illustrates a wider pattern in UK microplastics policy, where although research, evidence and potential regulatory approaches exist, they have not yet been translated into mandatory requirements, monitoring obligations or enforceable standards.

TACKLING MICROPLASTIC POLLUTION IN THE UK

Current UK policy responses to microplastics

Table 2. Existing UK strategies or policies relating to microplastics.

Policy or strategy	Main purpose	Status / implementation timeline	Microplastics considerations
Environmental Protection (Microbeads) Regulations: England 2017; Scotland 2018; Wales 2018; Northern Ireland 2019.	To prohibit the manufacture and sale of 'rinse-off' cosmetics and personal care products containing microbeads ²⁹⁰ .	Implemented. Manufacture and sale restrictions have been in force since 2018; Defra's post implementation review recommended keeping the ban ²⁹¹ .	Direct but limited in scope, only reducing one type of microplastic leakages. The term 'microplastics' is not used in the regulation, only 'microbeads'. Explicitly acknowledges that microbeads are a source of pollution and harms the environment and animal health.
25 Year Environment Plan, 2018	Plan with 10 goals aiming to deliver cleaner air and water, mitigate and adapt to climate change, minimise waste, protect threatened species and improve biodiversity ²⁹² .	In force as a long-term framework. The 25 Year Environment Plan remains the overarching "within a generation" framework but has been revised through the Environmental Improvement Plans (EIP), including EIP 2023 and the later EIP 2025 ²⁹³⁻²⁹⁵ .	Indirect and general, in aiming to eliminate all avoidable plastic waste, by 2042, but without legally binding targets. Seeks to reduce illegal waste, littering and marine plastic pollution. Actions stated, regarding plastics include:- encouraging producers to take more responsibility for the environmental impacts;- reducing demand for single use plastic;- making recycling easier; and- improving the rate of recycling. Microplastics are only directly mentioned in the context of research to establish biodegradable plastic standards.
Environment Act 2021, England	Provides a statutory framework for environmental governance, targets, environmental improvement plans, environmental principles, waste and resource efficiency, and powers to introduce measures such as Extended Producer Responsibility and the Deposit Return Scheme. Many of the Act's target setting and environmental improvement plan provisions apply primarily to England, while selected provisions apply more widely, including in Northern Ireland.	Implemented and enabling. In England, the Act underpins statutory environmental targets and Environmental Improvement Plans. In Northern Ireland, the Act provides for the Office for Environmental Protection, an Environmental Improvement Plan and environmental principles arrangements. Interim targets are not themselves legally binding ²⁹⁶ .	Indirect but foundational. Establishes key mechanisms and principles, including the precautionary principle, that could support action on microplastics. Enables upstream policy tools, and existing targets may indirectly affect plastic waste and some pathways associated with microplastic release ²⁹⁷ , but it does not explicitly address microplastics or set specific targets or requirements for their reduction.
Devolved environmental governance frameworks: Scotland, Wales and Northern Ireland	Scotland, Wales and Northern Ireland have separate environmental governance frameworks that partly perform equivalent functions to the Environment Act 2021. Scotland has the UK Withdrawal from the European Union (Continuity) (Scotland) Act 2021 established Environmental Standards Scotland, and the Environment Strategy in 2026 and has the Circular Economy (Scotland) Act 2024. In Wales, relevant frameworks include the Environment (Wales) Act 2016 and the Environment (Principles, Governance and Biodiversity Targets) (Wales) Act 2026. In Northern Ireland, equivalent arrangements are partly provided directly through the Environment Act 2021.	Implemented / developing. Scotland's Continuity Act 2021 and Circular Economy Act 2024 are in force, and Scotland's Environment Strategy was published in March 2026 ^{298,299} . Wales' Environment (Principles, Governance and Biodiversity Targets) Act became law on 27 April 2026 ³⁰⁰ . Northern Ireland's first Environmental Improvement Plan was published in September 2024, with the first annual progress report published in January 2026, and its Environmental Principles Policy Statement comes into force on 2 September 2026 ³⁰¹⁻³⁰³ .	Indirect but foundational. These frameworks are relevant to microplastics as they establish governance, principles, environmental strategies, waste/circular economy mechanisms and biodiversity or pollution related duties that could support future microplastic policy. However, none currently establishes a comprehensive or direct microplastic reduction target, monitoring framework, or regulatory limits for microplastic concentrations in water, sludge, soil, air or discharges.

TACKLING MICROPLASTIC POLLUTION IN THE UK

Current UK policy responses to microplastics

Table 2 (continued). *Existing UK strategies or policies relating to microplastics.*

Policy or strategy	Main purpose	Status / implementation timeline	Microplastics considerations
UK Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) 2021	Regulates the manufacture, import and use of chemicals in Great Britain, EU REACH continues to apply in Northern Ireland ³⁰⁴ . Aims to protect human health and the environment from harmful substances. UK REACH does cover polymers for some regulatory purposes, but polymers themselves are exempt from registration and evaluation. Monomers and other chemically bound substances in polymers may still need to be registered if the Article 6(3) thresholds are met ³⁰⁵ .	In force, with evidence work ongoing. Defra initiated a UK REACH work programme evidence project on intentionally added microplastics; the final Defra report was published in May 2025 and is being considered by Defra and devolved governments ^{306,307} .	Indirect with emerging relevance. Provides a potential route to regulate intentionally added microplastics and associated chemical additives but currently lacks specific provisions targeting microplastics. Regulatory action in this area remains limited compared to developments under EU REACH.
River Basin Management Plans (RBMP) - 2022 update	The plans, established under the The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, aim to protect and improve the water environment, by setting the legally binding locally specific environmental objectives that underpin water regulation (such as permitting) and planning activities ³⁰⁸ .	Current cycle runs 2022 to 2027. An interim progress report was published in 2025; the next full RBMP update is due by 22 December 2027 ^{309,310} .	No actionable responses. The plans acknowledge microplastics and identify research efforts, regulatory and voluntary mechanisms, but do not establish microplastic specific Environmental Quality Standards, routine monitoring or direct reduction targets ³¹¹ .
Water quality regulations for drinking water and bathing waters across the UK	To regulate the safety and quality of public drinking water supplies and designated bathing waters. Legislation differs by devolved nation. For drinking water, England is covered by the Water Supply (Water Quality) Regulations 2016; Wales by the Water Supply (Water Quality) Regulations 2018; Scotland by the Public Water Supplies (Scotland) Regulations 2014; and Northern Ireland by the Water Supply (Water Quality) Regulations (Northern Ireland) 2017. For bathing waters, England and Wales are managed under the Bathing Water Regulations 2013, as amended in 2025, while Scotland and Northern Ireland operate under separate bathing water regulations ³¹²⁻³¹⁴ .	Implemented and ongoing. Drinking water standards in England and Wales are defined through parameters covering microorganisms, chemicals, metals and aesthetic properties of water, while Scotland reports 51 drinking water parameters, with key parameters including coliforms, E. coli, iron, turbidity, manganese, lead, pH, colour, aluminium and trihalomethanes ^{315,316} . Bathing water classification across the UK is primarily based on faecal indicator bacteria, especially Escherichia coli and intestinal enterococci; England, Wales, Scotland and Northern Ireland each report monitoring on this basis ³¹⁷⁻³²⁰ .	Regulatory gap. Microplastics may be present in drinking water and bathing waters, but current UK water quality frameworks do not set microplastic concentration limits, routine sampling requirements, or classification thresholds. In drinking water, Defra has confirmed that drinking water quality is devolved and that the Drinking Water Inspectorate has commissioned research on microplastics, but also cited WHO advice that routine monitoring is not yet necessary ³²¹ . In bathing waters, statutory monitoring focuses on faecal contamination, meaning a bathing water can meet regulatory standards without any assessment of microplastic contamination. In contrast, the EU has developed a methodology to measure microplastics in drinking water with a view to adding them to the Drinking Water Directive watch list ³²² , highlighting a potential area where UK monitoring could fall behind emerging international practice.
Storm overflows discharge reduction plan 2022	Sets legally binding targets and requirements to reduce sewage discharges from storm overflows, improve water quality, and reduce environmental and public health harms associated with wastewater pollution.	Implemented as a statutory plan with long-term targets. Targets include improvements near designated bathing waters by 2035, ecological improvements for high-priority sites by 2045, and wider targets by 2050; a progress report was published in 2025 ^{323,324} .	Indirect but highly relevant. The plan recognises that storm overflow discharges can contain microplastics and other pollutants and seeks to reduce releases through improved wastewater management and reduced sewage discharges. However, it does not establish specific targets, monitoring requirements, or regulatory standards for microplastics themselves.

TACKLING MICROPLASTIC POLLUTION IN THE UK

Current UK policy responses to microplastics

Table 2 (end). *Existing UK strategies or policies relating to microplastics.*

Policy or strategy	Main purpose	Status / implementation timeline	Microplastics considerations
The Plastic Packaging Tax (General) Regulations 2022	Tax imposed on plastic packaging manufactured in or imported into the UK. Aims to encourage the use of recycled plastic in packaging increasing plastic recycling rates, reducing environmental harm from plastic packaging ³²⁵ .	Implemented from 1 April 2022. The rate increased to £228.82 per tonne from 1 April 2026 ³²⁶ .	Indirect and only applicable to plastic packaging. No explicit mention of microplastics in the legislation or guidance. Can indirectly influence secondary microplastics via material choice and recycling content.
Environmental Improvement Plan 2025, updating the 25 Year Environment Plan	Sets out the UK Government's plan to improve the natural environment, including targets and actions across air, water, waste, biodiversity and resource use.	Published in 2023 as the first revision of the 25 Year Environment Plan ³²⁷ . Current plan published December 2025. It updates the EIP framework and is supported by delivery plans for Environment Act targets ³²⁸ .	Indirect and high level. Recognises plastic pollution and commits to reducing environmental harm, but does not include specific targets, standards or measures for microplastics. References remain general and focused on broader plastics and waste reduction.
Plan for Water 2023 ³²⁹	An integrated plan for delivering clean water, covering both the water environment and water resources.	Published in 2023. It includes actions relevant to water pollution and states government expectations for industry to develop low cost, effective microfibre filters on washing machines, rather than creating a legal mandate ³³⁰⁻³³² .	Limited and indirect. Recognises microplastics as a water system concern, but does not introduce microplastic-specific standards, mandatory monitoring or legally binding controls for microfibre releases. Plans to change the law to ban the sale of wet wipes containing plastic are mentioned, but this is a small source of microplastic releases.
The Producer Responsibility Obligations (Packaging and Packaging Waste) Regulations 2024	Establishes legal obligations for packaging producers using extended producer responsibility, under powers of the Environment Act 2021. Aims to apply polluter pays principles to ensure packaging producers pay costs for managing their products' waste management and incentivise more sustainable designs ³³³ .	Regulations made in 2024 and applied across the UK. Revised packaging EPR implementation began in 2025, with producer fees and fee modulation being phased in ³³⁴⁻³³⁶ .	Indirect and limited in scope but with the potential to address upstream causes, such as improving product design. However, there is no explicit mention of microplastics in the legislation or guidance.
Wet wipes containing plastic bans England, Wales, Scotland and Northern Ireland	Ban on the sale of all plastic containing wet wipes. Includes exemptions, such as for medical use ³³⁷ .	Legislated / scheduled with different start dates across the UK: Wales from 18 December 2026; Northern Ireland from 18 May 2027; England from 19 May 2027; Scotland from 11 August 2027 ³³⁸⁻³⁴¹ .	Indirect and only applicable to plastic wet wipes. No explicit mention of microplastics in the legislation or guidance.
Deposit Return Scheme for drinks containers	To add a refundable deposit to single use drinks containers so consumers return them for recycling, thereby reducing litter, increasing recycling rates and generating higher quality recycled materials for reuse in drinks packaging ³⁴² .	Delayed / scheduled for launch from 1 October 2027. The scheme will operate in England, Northern Ireland and Scotland ^{343,344} . Wales has separate 2026 regulations and a separate scheme and intends to include glass, from 1 October 2027 to 30 September 2031 ^{345,346} .	Indirect and only applicable to selected single use drinks containers, preventing litter and improved collection/recycling, which can indirectly reduce microplastic pollution. No explicit mention of microplastics in the legislation but one acknowledgement in a Defra blog ³⁴⁷ .

Existing regulation covers only a small fraction of microplastic sources.

The UK's only targeted measure, the 2017 microbeads ban³⁴⁸ in rinse-off cosmetics is limited in scope, covering less than 5% of total microplastic releases in the UK and applying only to a narrow range of products³⁴⁹. Existing UK measures aimed at general plastics e.g., the Plastic Packaging Tax, packaging Extended Producer Responsibility (EPR), and the planned Deposit Return Scheme (2027) do not directly target microplastic leakages, although they may influence them indirectly through material use, waste reduction and product design. EPR makes producers responsible for their products along the entire lifecycle, including at the end-of-life stage, after a product has been disposed of. It has the potential to shift responsibility upstream to producers, and provides incentives so producers consider reducing microplastic leakages when designing their products³⁵⁰. Current standards for biodegradable mulch and compostable plastics apply only to specific categories. As such:

- There is no comprehensive regulatory framework covering major sources such as tyre wear, synthetic textiles, paints or pre-production plastic pellets.
- There are no regulatory limits or standards for microplastic concentrations in wastewater, sewage sludge, industrial discharges or air, leaving key release pathways unmanaged.

This gap is particularly significant given growing evidence of human exposure and potential health risks, which are not yet reflected in UK regulatory standards or thresholds.

Current approaches rely heavily on voluntary and non-binding measures.

Much of the UK's response to microplastics is based on voluntary schemes and guidance. For example, pellet loss prevention relies on voluntary schemes such as the private sector led UK Plastics Pact³⁵¹ and Operation Clean Sweep³⁵², the North Atlantic focused OSPAR Convention guidance on wastewater and microplastics³⁵³, and the International Maritime Organization's Action Plan to Address Marine Plastic Litter from Ships³⁵⁴. These approaches lack enforceable requirements, monitoring obligations or penalties for non-compliance, limiting their effectiveness and consistency. Where the government has considered regulatory intervention, such as microfibre filters on washing machines, measures remain advisory rather than mandatory, with no alternative controls introduced. As a result, there are major gaps in coverage across key leakage sources.

Fragmented institutional responsibility limits coordinated action.

Responsibility for addressing microplastic pollution is distributed across multiple departments and regulators, including Defra, the Environment Agency and the Department for Transport, with no single coordinating mechanism, despite overarching frameworks such as the Environment Act 2021. This fragmentation results in monitoring, policy development and implementation occurring in isolation across sectors such as water, waste, chemicals, transport and product regulation. In the absence of a clear lead authority or formal coordination structure, there is limited alignment between policy areas, inconsistent prioritisation of microplastic risks, and reduced ability to develop integrated responses. This weakens accountability, complicates delivery, and constrains the effectiveness of existing and future measures.

Evidence and research are not yet systematically translated into policy.

The UK has invested in research on tyre wear³⁵⁵, wastewater treatment and monitoring methods through programmes supported by Defra, UK Water Industry Research and the Environment Agency's Chemical Investigation programme³⁵⁶. The UK has invested £60 million in the Smart Sustainable Plastic Packaging programme³⁵⁷, supporting innovations to cut plastic packaging. While this has improved understanding of sources and pathways, findings are not yet consistently embedded in regulation or standards.

Monitoring and regulatory infrastructure are underdeveloped.

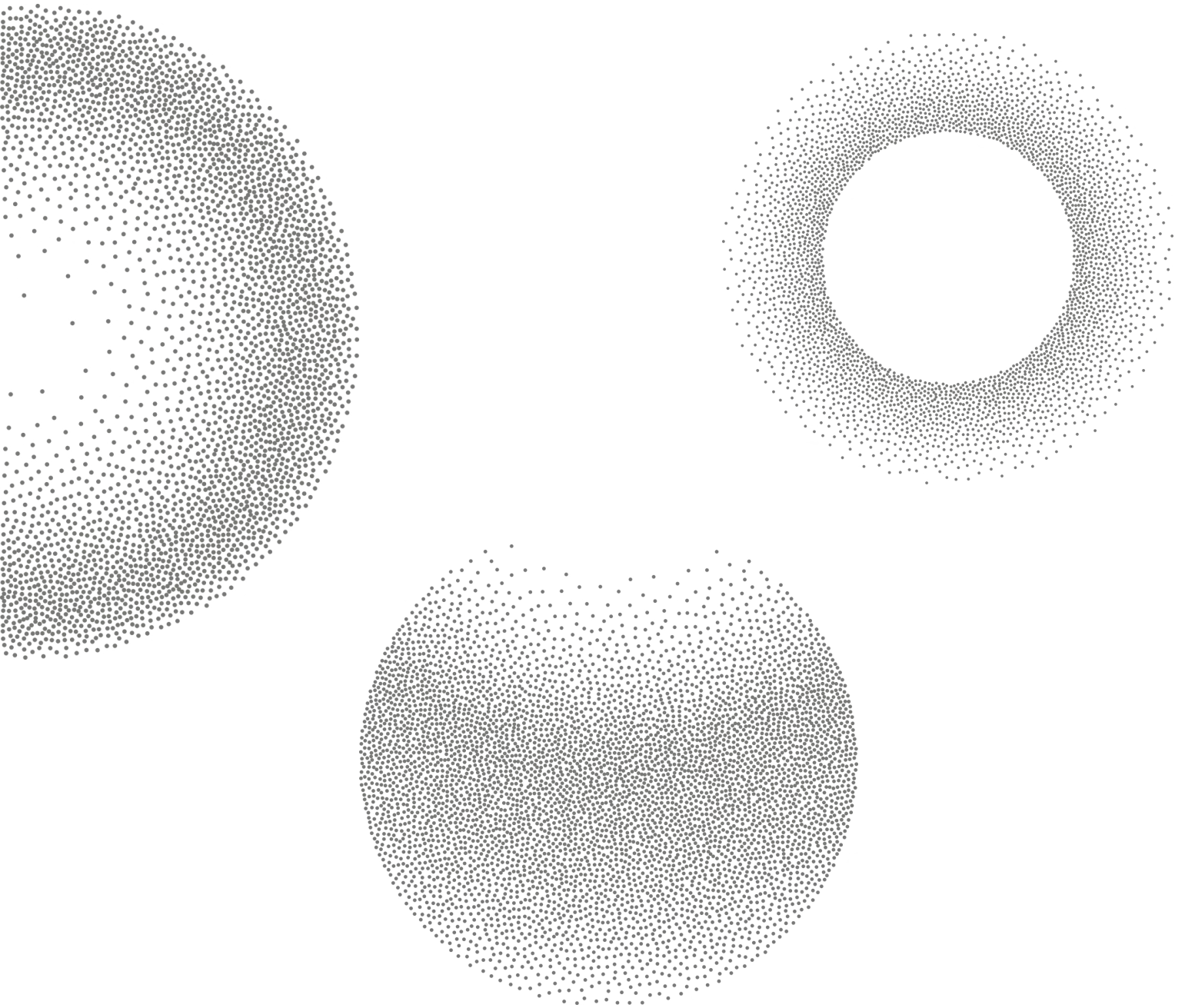
There is no coordinated national monitoring framework for microplastics and no agreed standards for measurement, reporting or compliance. The UK also has no regulatory limits for microplastic concentrations in wastewater, sewage sludge, industrial discharge or the air³⁵⁸. Monitoring of these pathways remains fragmented and largely research-led³⁵⁹. This absence of baselines and thresholds limits the ability to assess risk, enforce regulation or evaluate policy effectiveness, and constrains the development of targeted interventions.

The UK risks falling behind international regulatory approaches.

The EU and USA are progressing measures to reduce microplastic pollution, including restrictions on intentionally added microplastics³⁶⁰, proposed limits for tyre leakages³⁶¹, requirements linked to wastewater^{362,363} and product standards^{364,365}, and the EU has its Zero Pollution Action Plan that aims to reduce microplastics released into the environment by 30% by 2030³⁶⁶. In terms of addressing microfibrils, various governments have proposed legislation to mandate the use of filters in washing machines, such as France and parts of the US^{367,368}, though not all of these have been implemented, government support also exists in terms of education, advocacy, roadmap development, and funding for research and innovation³⁶⁹⁻³⁷¹. In contrast, the UK's approach to addressing the impacts of microplastics remains limited, fragmented and indirect. This divergence may increase uncertainty for industry, delay investment decisions, and complicate alignment with international regulatory frameworks and trade partners.



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6 Targeted policy actions for microplastics

This section identifies five priority policy areas that together constitute a strategic and integrated approach to reducing microplastic pollution in the UK. These actions are grounded in the evidence submitted and have been highlighted by stakeholders as necessary, achievable and urgent. The policy areas and recommendations presented below are not ranked in order of priority but are intended to be mutually reinforcing and all are considered important for achieving meaningful reductions in microplastic pollution and the associated impacts on human health, the economy and environment.

TACKLING MICROPLASTIC POLLUTION IN THE UK

Targeted policy actions for microplastics

Table 3. Targeted policy priorities for addressing microplastics in the UK over five years.

Priority policy area	Rationale	Priority asks
1. Establish a clear UK policy framework with targets	A coherent UK policy with clear, time-bound targets is needed to replace fragmented measures and enable coordinated action on microplastic pollution in line with growing health, environmental, and economic risks.	Develop a UK Microplastics Strategy or Bill with time bound reduction targets to reduce leakagesEstablish clear cross-government leadership and coordination including a body or ministerIntegrate microplastic controls into existing environmental and circular economy policies such as the Plan for Water and incoming Circular Economy strategy.Embed periodic review mechanisms to update targets and measures in line with emerging evidence, with public reporting of progress.
2. Regulate high leakage sources	Focusing regulation on a small number of high-emitting sectors offers the clearest and most effective way to reduce microplastic leakages while closing a major UK policy gap.	Mandate product design and material standards for priority sectors to reduce microplastic shedding and hazardous chemical content, supported by clear labelling requirements.Establish legally binding leakage reduction requirements for major microplastic sources.Expand bans of avoidable sources of intentionally added microplastics beyond rinse-off cosmetics.
3. Use EPR and economic tools to drive reduction	Expanding producer responsibility would incentivise cleaner product design and reduce microplastic releases at source using existing, scalable UK policy tools.	Extend mandatory EPR to priority microplastic-intensive sectors.Define clear legal and financial producer responsibility.Mandate reporting on polymer types and plastic-associated chemicals used in all products.Deliver a consistent, UK-wide Deposit Return Scheme on time.
4. Strengthen wastewater, sludge and soil protections	Strengthening controls on wastewater, sewage sludge, and agricultural practices is needed to reduce a major, currently unmanaged pathway for microplastics entering soils, waterways, and food systems.	Upgrade wastewater treatment infrastructure to include advanced and tertiary filtration.Integrate sludge into Environmental Permitting regulations.Set interim precautionary thresholds or risk-based limits for microplastic and plastic-associated contaminants in sludge applied to landMandate microfibre capture measures for washing machines.
5. Build a coordinated monitoring and evidence system	Establishing a coordinated national monitoring system for microplastics is essential to underpin effective target-setting, regulation, enforcement, and evidence-based policymaking in the UK.	Agree and adopt clear, standard definitions for micro and nano-plastics within UK policy.Establish a national monitoring framework across human health, water, sludge, soils, and air. Harmonise sampling, analytical methods and reporting by building on BSI and international work.Mandate targeted monitoring and reporting from priority sectors and pathways, supported by mandatory producer disclosure of polymer composition and additives.Fund targeted research to address key evidence gaps to support understanding of microplastic sources, pathways, impacts and safe thresholds.

These policy recommendations are designed to intervene at every stage of the plastics lifecycle, prioritising prevention at source, safer product design, and reduced production alongside controls on leakages during use. They also strengthen downstream systems, including wastewater, sludge and waste management, while establishing monitoring and evidence to track impacts and guide adaptive policy. This whole-lifecycle approach ensures microplastic pollution is addressed systemically to prevent the risks to human health, food systems and the economy.

1 Establish a clear UK policy framework with targets

The UK has no comprehensive policy framework to address microplastics in the environment or their upstream sources. This is despite the risks posed by increasing plastic production and associated microplastic releases^{372,373}, in the context of wider environmental decline where recent government reports have found every “critical ecosystem is on a pathway to collapse (irreversible loss of function beyond repair)”³⁷⁴. Acting early, in line with the precautionary principle set out in the Environment Act 2021³⁷⁵, can reduce the risk of long term and potentially irreversible impacts.

The UK can become a global leader, by creating a comprehensive policy framework, with legally binding time bound targets, to reduce microplastic releases into the environment. Given devolved responsibilities for environmental policy, the framework should be developed in coordination with devolved governments to ensure alignment of targets, regulatory approaches and monitoring systems across the UK. Evidence from other environmental domains shows that defined targets improve policy effectiveness and support delivery^{376,377}. Research has also shown that taking a systemic approach, addressing the whole life cycle of plastics and integrating microplastics into existing policies, is more effective than standalone action³⁷⁸.

A coordinated framework can also reduce uncertainty for industry, support investment in safer materials and product design, and help manage longer term environmental, human health, and economic risks. Early action is likely to be more cost effective than delayed intervention as pollution accumulates^{379,380}. As environmental degradation increasingly affects food, water and wider economic resilience, early action can also strengthen the UK’s long-term security and prosperity³⁸¹.

PRIORITY ACTIONS:

- Develop a UK Microplastics Strategy or Bill with time bound reduction targets to reduce leakages, including through design requirements and reducing the volume of plastics placed on the market, and with human health protection as a specific objective.
- Establish clear cross-government leadership and coordination mechanisms for delivery, this could include a designated minister or body responsible for microplastic pollution.
- Integrate microplastic controls into existing environmental and circular economy policies such as the Plan for Water and incoming Circular Economy strategy.
- Embed periodic review mechanisms to update targets and measures in line with emerging evidence, with public reporting of progress.



2 Regulate high leakage sources

Targeting the largest sources of microplastic leakage offers the most direct route to reducing pollution at scale. High emitting sectors such as tyres, textiles, paints, plastic pellets and intentionally added microplastics are well evidenced and represent preventable leakage sources³⁸²⁻³⁸⁴, recognising that pathways such as wastewater systems transport these sources into the environment. Addressing these sources can reduce reliance on downstream treatment and clean-up, which is often less effective and more costly over time.

Experience from decarbonisation demonstrates that stable, long-term regulation can stimulate investment and innovation³⁸⁵. The UK low carbon sector is projected to exceed £1 trillion by 2030, reflecting the role of stable policy frameworks in driving economic growth³⁸⁶. Similar approaches applied to microplastic releases could deliver comparable benefits. Major emitting sectors, including plastics, are commercially mature and well resourced, with the UK plastics industry generating over £32.8 billion in annual turnover³⁸⁷, indicating that major emitting sectors have the capacity to adapt to stronger regulatory requirements.

Clear regulatory requirements across high leakage sources can reduce environmental and human exposure, support more consistent industry practice, and create a level playing field for businesses already investing in lower release products and processes. It can also provide clearer long-term signals for innovation in materials, product design and production systems^{388,389}. Targeting high leakage sectors may also be widely supported, with one UK survey of the public finding 70% supported regulation of microplastic polluting industries³⁹⁰.

Addressing high leakage sources will require a combination of measures across the product lifecycle, with this report focusing on the priority actions that can be implemented within a five-year timeframe.

PRIORITY ACTIONS:

- Mandate product design and material standards for priority sectors to reduce microplastic shedding and hazardous chemical content, supported by clear labelling requirements.
- Establish legally binding leakage reduction requirements for major microplastic sources, supported by monitoring and reporting obligations. This includes tyres, textiles, paints, agricultural products, and pellets.
- Expand bans of avoidable sources of intentionally added microplastics beyond rinse-off cosmetics to cover fertilisers, microplastic infill materials, agricultural products, industrial abrasives, detergents, paints, and chewing gum; in alignment with international approaches and EU restrictions on intentionally added microplastics under REACH.



3

Use Extended Producer Responsibility and existing economic tools to drive reduction

Economic incentives to reduce microplastic releases remain limited at present. Extending Extended Producer Responsibility (EPR) to major sources of microplastics would shift responsibility upstream to where product design, material choices and release prevention can be addressed most effectively^{391,392}.

A strengthened EPR framework could reduce costs currently borne by local authorities, improve transparency over material and financial flows, and generate revenues to support monitoring, mitigation and system improvements³⁹³⁻³⁹⁶. Eco-modulated fees can further steer the market by rewarding lower shedding, safer and more durable products, while increasing costs for higher impact products³⁹⁷⁻³⁹⁹.

EPR aligns with the polluter pays principle under the Environment Act 2021⁴⁰⁰, and is likely to be publicly acceptable, with strong support (75% of surveyed public) for holding producers accountable for the impacts of their products⁴⁰¹. The following priority actions balance building on existing policy infrastructure and being implementable within current legislative and institutional pathways.

PRIORITY ACTIONS:

- Extend mandatory EPR to priority microplastic-intensive sectors, focusing initially on textiles, tyres and plastic pellets, building on existing EPR frameworks.
- Define clear legal and financial producer responsibility, including requirements for traceability, reporting and accountability for tracking of material flows across the full product lifecycle.
- Mandate reporting on polymer types and plastic-associated chemicals used in all products to enable identification of key microplastic sources, improve traceability of emissions, increase public awareness, and support safer by design approaches.
- Deliver a consistent, UK-wide Deposit Return Scheme on time, with alignment across devolved administrations to maximise return rates and reduce environmental leakage.



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4 Strengthen wastewater, sludge and soil protections

Wastewater systems are a major pathway through which microplastics, and associated contaminants enter rivers and agricultural soils. Current treatment processes largely transfer, rather than eliminate, these contaminants, concentrating them in sewage sludge that is widely applied to land^{402,403}.

Existing regulatory and permitting frameworks are not suited to the complexity of hazardous contaminants emerging at this scale in wastewater⁴⁰⁴. The UK government response acknowledges sludge applications as a pollution source but so far has only proposed consultations on extending environmental permitting regulations^{405,406}. There are currently no specific standards or controls addressing microplastic contamination across these systems. Research commissioned by Defra recommends reducing sewage sludge use, by a minimum of 50%, due to the cost effectiveness of reducing exposure to other contaminants, such as forever chemicals⁴⁰⁷.

Public concern about wastewater and the condition of UK rivers is high⁴⁰⁸, and has been subject to extensive media attention. Surveys have found that river health is an influential voting consideration⁴⁰⁹, with 87% of the surveyed public supporting more regulation and monitoring, and requiring water companies to remove contaminants including microplastics from sewage sludge⁴¹⁰.

Targeted regulatory updates and investment in treatment and monitoring can reduce long term environmental and health risks⁴¹¹, while improving public confidence that sewage sludge is managed safely^{412,413}.

PRIORITY ACTIONS:

- Upgrade wastewater treatment infrastructure to include advanced and tertiary filtration capable of capturing smaller microplastic particles across multiple sources, not limited to fibres.
- Integrate sludge into Environmental Permitting regulations by requiring permits for treatment, storage and land application, with clear compliance and monitoring conditions.
- Set interim precautionary thresholds or risk-based limits for microplastic and plastic-associated contaminants in sludge applied to land, with a clear pathway for refinement as evidence develops. Begin with precautionary or risk-based thresholds to guide safe use while fuller standards are developed.
- Mandate microfibre capture measures for washing machines by introducing requirements for microfibre filters on new washing machines, alongside standards for performance, maintenance and disposal.



Photo © Thames21

5

Build a coordinated monitoring and evidence system

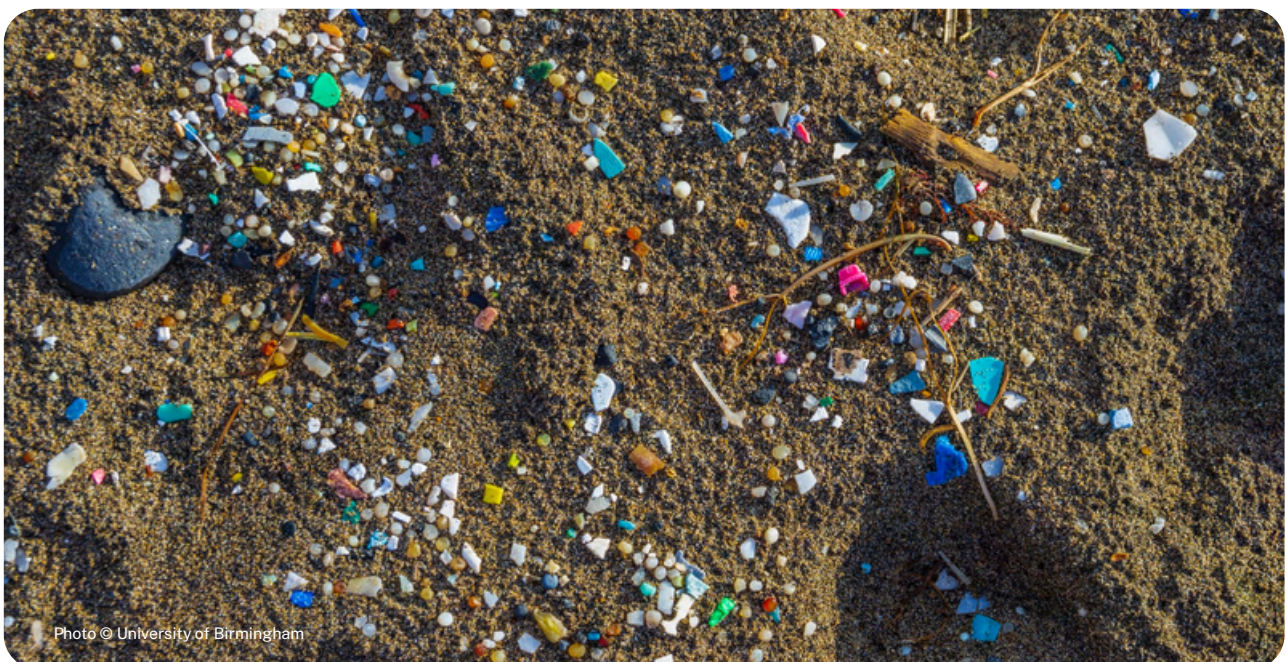
The UK lacks a coordinated national system to measure microplastic exposure. There are no agreed definitions, limited harmonisation of sampling and analytical methods, and no consistent statutory monitoring across key environmental media or priority sectors. This constrains the ability to assess risks, prioritise interventions, and evaluate policy effectiveness.

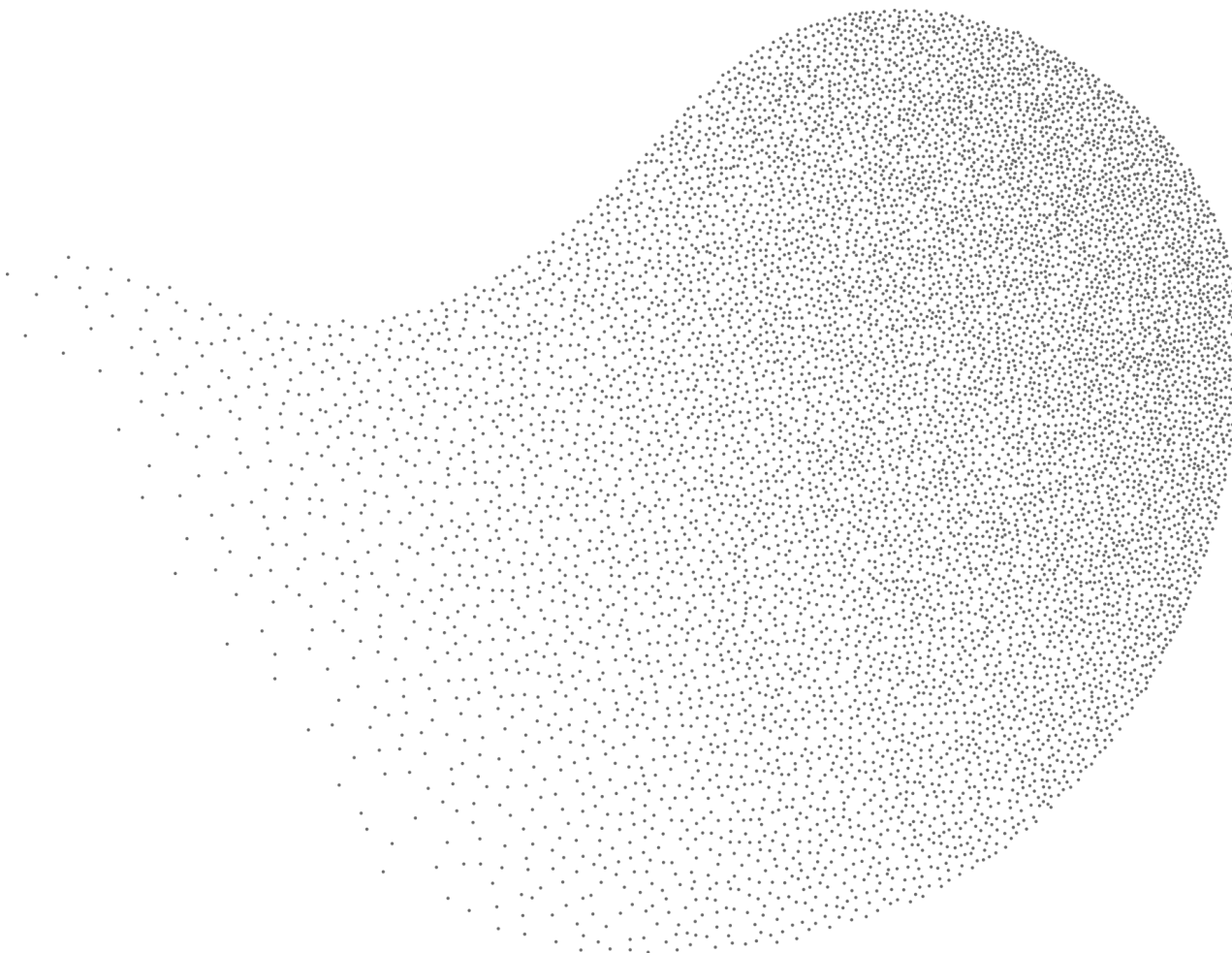
A coordinated national monitoring and evidence system would enable all other microplastics policies proposed here to function, as well as enable more targeted and effective policy by improving comparability of data, establishing baselines, and supporting the development of proportionate regulatory responses⁴¹⁴. It would also strengthen alignment with international approaches and ensure that UK policy keeps pace with emerging scientific understanding^{415,416}. While full standardisation may not be feasible across all contexts, greater harmonisation of methods and definitions is necessary to ensure data are comparable and usable for policy. Standards Institution (BSI) developing methods that could underpin national protocols⁴¹⁷, and water companies have participated in research to provide proof of concept for routine monitoring in wastewater and sludge⁴¹⁸.

Strengthening monitoring systems is also important for public health. Improved data on exposure through food, drinking water and air can support risk assessment and inform future regulatory action, particularly as evidence on health impacts continues to develop.

PRIORITY ACTIONS:

- Agree and adopt clear, standard definitions for micro and nano-plastics within UK policy, aligned with international terminology to provide clarity for regulation, monitoring and enforcement.
- Establish a national monitoring framework across human health, water, sludge, soils, and air. Cover water, sludge, soils and air as a first phase, with clear roles for delivery bodies. Integrate citizen science to expand coverage and public engagement.
- Harmonise sampling, analytical methods and reporting by building on BSI and international work to ensure consistency and comparability across datasets, while allowing for flexibility of methods where needed.
- Mandate targeted monitoring and reporting from priority sectors and pathways, supported by mandatory producer disclosure of polymer composition and additives, to improve traceability and policy relevance of data.
- Fund targeted research to address key evidence gaps to support understanding of microplastic sources, pathways, impacts and safe thresholds, aligned with national monitoring priorities and future regulatory needs.

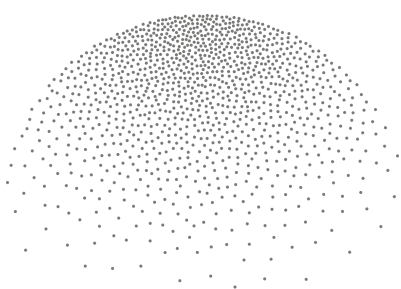




Conclusion

Microplastics are now ubiquitous in the environment and found throughout the human body. Microplastic pollution is almost impossible to clean up or remove. While uncertainties remain around the impacts of microplastic pollution on people and the planet, evidence already shows widespread presence and increasing concentrations of microplastic pollution, and credible risks across ecosystems, food systems and human health. Waiting for full scientific certainty risks locking in impacts that are far more costly, complex and potentially irreversible to address later.

The UK is therefore at a decision point. It can continue with a fragmented and largely indirect approach to tackle microplastic pollution, or it can act in line with emerging evidence and international momentum to establish a coherent, preventive policy framework. Early, coordinated action would reduce long-term costs, provide clarity for industry, and avoid the need for reactive regulation in the future. Without this, the UK risks not only environmental and public health consequences, but also falling behind in shaping standards, markets and policy direction in an area that is rapidly evolving.



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Appendix 1: Methods

The Group issued an open call for evidence between November 2025 and March 2026. Written submissions were invited from across sectors to gather evidence on the sources, impacts, and policy responses relating to microplastics. Submissions were collected via an online SurveyMonkey questionnaire.

The questions were designed by the APPG Secretariat, informed by discussions with academic advisers at the Global Plastics Policy Centre and by gaps identified in previous reviews, including the last APPG microplastics report⁴¹⁹. Questions were deliberately structured to elicit both quantitative data and qualitative insights, and to align with policy-relevant decision-making needs.

SURVEY TOPICS AND QUESTION AREAS INCLUDED:

Topic	Question breakdown
Contributors	- In your view, what are the most significant sources /contributors / pathways to microplastic pollution? (e.g. textiles, tyres, packaging, synthetic turf, wastewater, etc.) - What up-to-date information do you have on the scale of different sources of microplastic pollution? - What are the key gaps in knowledge and monitoring of microplastic pollution? - Where possible, please include quantitative data or references on emission volumes or relative source contributions in the UK specifically.
Impacts	- What do you see as the most significant impacts of microplastic pollution across health, environment, and the economy? - Where is there strong evidence? - Where is more research needed? - What are the key gaps in knowledge and monitoring of impacts? Please include any insights on indirect or systemic impacts, for example, on soil productivity, carbon cycling, or food systems.
Solutions	- In your view, what needs to be done in the UK to tackle microplastic pollution? - In your view, what legislative action, if any, is needed? - What government policy changes, if any, are needed? - What are the most effective, urgent or practical measures? - How could the circular economy and Extended Producer Responsibility be utilised to tackle microplastic pollution? - How could action on microplastics be embedded within existing UK policy frameworks (such as the Plan for Water, 25 Year Environment Plan, or Circular Economy initiatives)?
Final Reflections	- What would a cohesive UK strategy on microplastics look like to you? - What would a UK microplastics roadmap or target-based framework need to include?

In total, thirty-six written responses were received. Evidence submitted included policy proposals, technical evidence (both peer-reviewed and grey literature), and practitioner insights. Contributors represented a diverse range of stakeholder groups, including environmental charities and NGOs, water companies, academic institutions, alternative material businesses, microfilter and washing technology providers, community and residential campaign groups, and trade associations (Figure 2).

Despite targeted outreach to industry bodies, representation across some key sectors was limited. Manufacturers associated with major sources of microplastic releases were largely absent, including paint and coatings manufacturers, plastic pellet producers, personal care product manufacturers, tyre manufacturers, and general plastics manufacturers. In addition, the evidence base lacked contributions from several important stakeholder groups, including health and social justice organisations, local government bodies (including waste management and recycling services), the agriculture sector, the transport sector, consumer advocacy organisations, and standards-setting organisations.

These gaps are acknowledged as a limitation of the inquiry and highlight priority areas for future engagement and research.

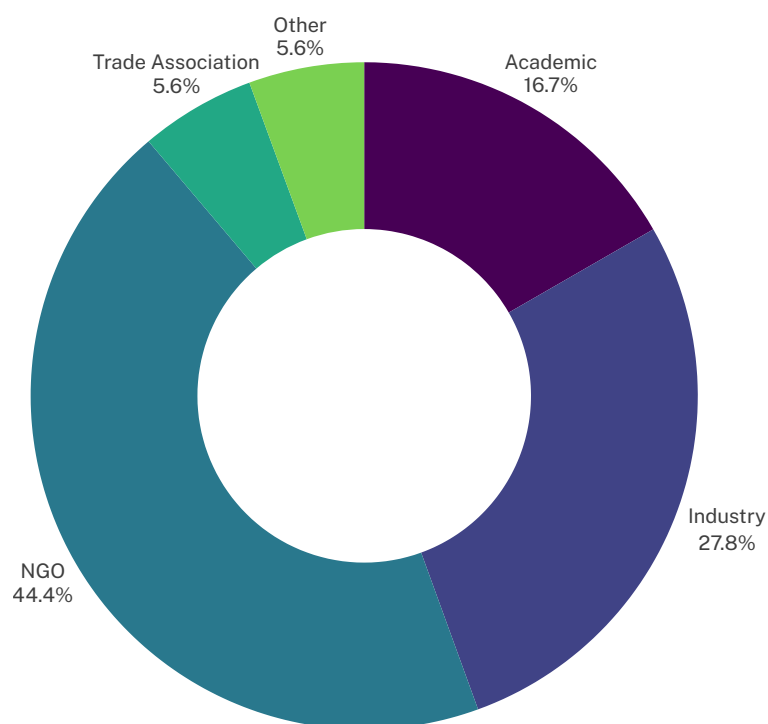


Figure 2. *Proportion of Evidence Submissions by Stakeholder Group.*

EVIDENCE FRAMEWORK AND ANALYTICAL APPROACH

All submissions were systematically analysed using a structured evidence framework developed specifically for this inquiry. The framework is a deductive, policy-focused analytical tool designed to organise and interrogate diverse forms of evidence in a consistent and rigorous manner. The framework is organised around three categories complementing the questions asked in the call for evidence. The categories are:

- sources of microplastics;
- impacts of microplastics on human, environmental, economic and food systems; and
- responses to microplastic pollution through existing or proposed interventions.

Within each of these categories, a set of predefined analytical questions was used to assess the submissions. Evidence was mapped against these questions, enabling comparison across stakeholders and sectors within a shared analytical structure.

Initial sorting and categorisation of submissions used a combination of manual review and limited AI-assisted text processing to support consistent tagging of evidence against framework questions. All categorisation was reviewed and validated by human researchers to ensure accuracy and appropriate interpretation.

The evidence framework was adopted to enable a robust and policy-relevant analysis of a complex and cross-sectoral issue. The submissions reflected a wide range of perspectives, expertise and priorities. The framework provided an analytical structure that allowed this diversity to be compared without oversimplification. By applying a consistent set of predefined questions across all submissions, the approach improved transparency and reduced the risk of selective interpretation, making the analysis more replicable and auditable. The framework was designed to capture not only areas of established evidence but also gaps, uncertainties and points of disagreement, particularly in relation to health impacts, source attribution and monitoring capability. Finally, by spanning sources, impacts and responses, the framework enabled a whole-system perspective.

An anonymised version of the evidence framework is available upon request.

EVIDENCE SYNTHESIS AND REPORTING

The Global Plastics Policy Centre supported independent analysis of all submissions using the structured evidence framework described above. Evidence was synthesised to identify areas of convergence across stakeholders, as well as divergence, uncertainty, and gaps in the evidence base. All submissions were treated with equal weight. Priority areas for policy action were identified through a combination of factors, including the frequency with which issues were raised, the strength and consistency of supporting evidence, and their relevance and feasibility within a five-year policy timeframe.

The synthesis process aimed to distinguish clearly between stakeholder views, the underlying evidence, and the interpretation of the research team. Where possible, findings were triangulated across multiple submissions, the full collection of evidence referenced, and discussed with subject matter experts. The analysis informed the development of policy areas and associated priority actions presented in this report. Areas where evidence was limited, contested or absent are highlighted to support transparency, and to guide future research and engagement.

Appendix 2: Research and knowledge gaps

Respondents highlighted many significant gaps in our understanding of microplastics, however research on microplastics is expanding rapidly, producing a substantial and increasingly coherent evidence base. Remaining uncertainties largely reflect system complexity rather than a lack of evidence, and methodological advances are expected to strengthen understanding⁴²⁰. Respondents repeatedly stated the current evidence base is sufficient to justify precautionary and preventative policy action, alongside the need for continued investment in research.

GAPS IN UNDERSTANDING SOURCES AND PATHWAYS

Submissions mentioned key uncertainties and the need for more research relating to virtually all sources and pathways of microplastics highlighted in this report. However, of note was that research on wastewater treatment plants has predominantly focused on larger particles (≥ 50 – $100\ \mu\text{m}$), leaving smaller microplastics inadequately understood^{421,422}. Further, our understanding of spatial and temporal distribution of microplastics remains limited, including vertical transport in aquatic systems and sediments⁴²³, atmospheric dispersion and deposition, episodic releases (e.g. storm overflows, fireworks), and catchment-scale transport processes.

ENVIRONMENTAL FATE AND ECOSYSTEM IMPACTS

Understanding of microplastic transformation, persistence, and environmental lifetimes is poor, particularly for weathering induced physical and chemical changes. In soils, limited monitoring in the UK, combined with inputs from biosolids, sludge, and agriplastics, contributes to insufficiently quantified contamination levels. This warrants further investigation into impacts on soil productivity, microbial and insect communities, and implications for food security^{424,425}.

Freshwater systems lack routine monitoring and ecotoxicological evidence, especially for sensitive freshwater species. In the marine environment, potential impacts on phytoplankton, microbial processes, carbon cycling and oxygen production are globally important environmental services and urgently require further study. Research on ecosystem functioning and biodiversity impacts is at an early stage. Multispecies and ecosystem level studies are needed to clarify how microplastics interact with other contaminants and stressors, and whether some ecosystems are more vulnerable to threshold effects.

RISKS FROM CHEMICALS AND OTHER CONTAMINANTS

Chemical risks remain uncertain, as hazard data is unavailable for most of the 10,000 plus plastic associated chemicals^{426,427}. The extent and pathways of additive release and the relative contributions of physical versus chemical toxicity also remain unresolved⁴²⁸. Additional research is needed on microplastics as vectors for other contaminants, including heavy metals⁴²⁹, microbial colonisation and biofilms⁴³⁰, antimicrobial resistant bacteria, and combined toxic effects with PFAS^{431,432}, as well as implications for human health⁴³³.

HUMAN EXPOSURE AND HEALTH EFFECTS

Human exposure and toxicology constitute another major evidence gap. Quantification of ingestion, inhalation and cumulative lifetime exposure is not yet systematically assessed, especially for vulnerable or high exposure populations. Toxicological frameworks remain underdeveloped⁴³⁴, and dose response relationships for chronic low dose exposure are poorly defined⁴³⁵. Nanoplastic uptake across biological barriers and associated risks remains largely unknown⁴³⁶. Long-term and population level health studies are largely absent.

MEASUREMENT, MONITORING AND STANDARDISATION

As an evolving field, detection and analytical methods continue to develop, but the lack of fully standardised protocols affects comparability across studies⁴³⁷. There is no internationally agreed definition of microplastics or microfibrils, and sampling, detection, classification and reporting remain inconsistent⁴³⁸. Detection technologies are costly, labour intensive and remain insufficient for nanoplastics and airborne microplastics. Organic matter interference restricts accurate aquatic quantification. Monitoring infrastructure across the UK is fragmented, and transparency on plastic production, transport and leakage requires improvement.

EFFECTIVENESS OF INTERVENTIONS AND POLICY EVIDENCE

Evidence on intervention efficacy is underdeveloped. Alternative plastic materials, including biodegradable plastics, are a potential solution to the issue but the environmental behaviours, persistence and microplastic releases from these materials is not well understood^{439,440}, and long-term field studies are needed. Microfibre filters are proposed as a solution, but the end-of-life management of captured fibres has not been researched. System wide assessments of mitigation strategies are needed to evaluate efficacy, life cycle impacts, equity considerations, and unintended consequences. Economic analyses of intervention costs and pollution impacts, alongside research into public awareness, behaviours, and social acceptability, are essential for supporting policy implementation.

IMPLICATIONS FOR POLICY AND RESEARCH PRIORITIES

Addressing these gaps will require coordinated action across research, policy and funding systems. Stakeholders identified the following priority areas for government support:

- Provide and facilitate research and innovation funding, this could include grants from Extended Producer Responsibility or Plastic Tax generated incomes, as well as public-private partnerships;
- Ensure research is open access, shared and accessible, to create transparency and accountability;
- Integrate research into policy, by including researchers and stakeholders into policy design processes;
- Facilitate and convene multi-stakeholder, interdisciplinary collaborations;
- Establish review mechanisms in any new or updated legislation, to keep policy in line with advances in the evidence base.

Appendix 3: Non-government approaches to tackle microplastic pollution in the UK

Non-government and citizen-led initiatives play an important role in addressing microplastic pollution in the UK, particularly in advancing research, raising awareness, and piloting interventions where formal policy responses remain limited. These efforts provide valuable insights into sources, pathways, and impacts, and often act as early indicators of emerging issues. While they are not a substitute for coordinated regulatory action, they complement government efforts and, in some cases, help to fill gaps in monitoring and evidence generation. This annex summarises key examples of citizen science and non-government activity, highlighting their contributions and potential to inform more structured national approaches.

Citizen science initiatives: Behavioural interventions and citizen-science programmes form a significant part of the UK's current response to microplastics. Examples of current citizen science initiatives include:

- Keep Britain Tidy – public campaigns and litter insights⁴⁴¹;
- CSI for the Ocean – community microplastic sampling⁴⁴²;
- The Big Microplastics Survey⁴⁴³ and The Great Nurdle Hunt⁴⁴⁴ – large-scale global citizen science project initiated in the UK;
- GB Row Challenge – rowing teams gather microplastic and environmental data around the UK coastline⁴⁴⁵; and
- Trash Free Trails – initiative empowering local communities to survey, monitor, and remove single use pollution from UK trails and wild places⁴⁴⁶.

These initiatives serve as educational tools and engage the public directly in monitoring microplastics across UK environments.

Academic/ Community collaborations: There are numerous collaborations around the UK between academic institutions and NGOs. An example of an NGO and academic partnerships includes a collaboration between Trash Free Trails and postgraduate researchers at Bangor University, whereby field experiments on the fate of single-use materials in forest soils are conducted⁴⁴⁷. The University of Portsmouth have also partnered with GB Row Challenge to analyse the environmental data collected by a team of rowers as they row around UK waters. This collaboration has led to a greater understanding of microplastic numbers around the British Isles⁴⁴⁸.

Non-government policy development: NGOs and academic partners have increasingly used policy briefs as a tool to translate complex scientific evidence on microplastics into clear, actionable recommendations for decision-makers. These briefs play a dual role by raising public awareness of microplastic pollution while synthesising and highlighting the growing body of scientific evidence on its environmental and health impacts. They also advocate for targeted, sector-specific interventions and draw attention to key regulatory gaps where existing policy frameworks remain insufficient. Through this approach, policy briefs aim to support evidence-based decision-making and encourage more coordinated and effective governance responses to microplastics.

The Global Plastics Policy Centre recently developed a policy brief (in collaboration with the Plymouth Marine Laboratory, University of the West of England, Bangor University, the University of Plymouth Marine Institute, the University of Exeter Global Systems Institute, ETH Zürich, and the Lancaster University Environment Centre)⁴⁴⁹ outlining the current regulatory landscape for microplastics in the UK. Key policy recommendations from this are as follows:

- Establish a clear policy framework or roadmap
- Set measurable targets and timelines
- Develop measurable targets to reduce primary plastic production and use
- Invest in research to tackle evidence gaps
- Adopt a sector specific approach
- Adopt and advocate for international best practices.

A collaboration between Nuud Ltd., Queen's University Belfast, Just One Ocean, the Plastic Health Council and Common Seas have produced a policy brief to address plastics in chewing gum⁴⁵⁰. The recommendations from this brief were:

- Mandatory transparent labelling of plastic ingredients
- Age restrictions on purchasing
- Restrictions on point-of-sale locations
- Mandatory health warnings on packaging
- Introduction of a plastic health tax
- Legislative ban on plastics-based chewing gum

Civil society organisations are also increasingly engaging directly with policymakers to address specific exposure risks. For example, the Plastic Free Babies campaign, launched in Parliament in 2026, highlights the potential health risks of microplastic exposure in early life and calls for regulatory action on plastic use in infant products and food contact materials. Such campaigns bring emerging scientific concerns, particularly around human health, into the policy arena and contribute to shaping the direction of future regulatory responses.

Submitted evidence stresses that a robust UK strategy could include quality-assured citizen-science monitoring within a national, standardised framework. Currently, despite their value, such initiatives remain informal and not systematically integrated into government monitoring or decision-making.

Government actions are characterised by fragmented and largely non-enforceable measures with major regulatory gaps. The UK relies heavily on voluntary schemes, research projects, and high-level strategy documents without clear targets or standards. Citizen science and non-government work fill many of the evidence and awareness gaps yet they operate without formal integration into national regulatory frameworks or sufficient financial backing.

Appendix 4: Sector Approaches

This report has recommended policy action in the next five years to include regulating high microplastic emitting sectors. However, evidence from the 36 submissions gave recommendations for a wider range of sectors, beyond but including high emitters. Sector specific recommendations will require in-depth research and consultation with stakeholders, which is outside the remit of this report. As such, the list below can be taken as a suggestion for further research and dialogue.

Agriculture

Recommendations for reducing microplastics in the agricultural sector focused on the use of sewage sludge and agriplastics.

Establishing legally binding thresholds for micropollutants (covering microplastics and other contaminants such as forever chemicals and pharmaceuticals) in soil was recommended. Following this would be establishing historical levels of pollution, then ongoing monitoring requirements to cover: microplastics entering wastewater systems, quantities retained in sewage sludge, quantities discharged via treated effluent, where and when sewage sludge and biosolids are applied, and cumulative loading to specific soils and catchments over time.

Respondents suggested restricting, phasing out and banning the application of sewage sludge on farmland, until tested for contaminants and proven within safe thresholds. This could be enforced by incorporating microplastic pollution into Environmental Permitting Regulations, requiring permits for treatment, storage and use of sewage sludge on agricultural land.

Agriplastics can include protective films and nets, mulching on soil, polytunnels, irrigation piping and for packaging of products. These plastics are often thin, prone to fragmentation, mismanaged at the end of life, and often ploughed into soils⁴⁵¹. Respondents recommended restricting and reducing the use of agriplastics. This could be done using Extended Producer Responsibility regulations, which could improve the design of agriplastics to make them more durable and reusable, and to encourage the use of plastic alternatives.

It was also acknowledged that farmers may require support to use alternative products, and financial incentives could be made available.

Alternative materials

Respondents recommended evaluating bioplastics for safety and sustainability, alongside the impacts of the plastics they aim to replace, to reduce unintended consequences and regrettable substitution (where one restricted material or chemical is replaced with another that is not restricted but also not proven to be safe). If combined with using Extended Producer Responsibility schemes, favourable eco-modulated fees could be applied to those bioplastics that are proven to be the safest, so their producers may be exempt from fees or provided with other financial incentives, like tax relief. Funds generated from EPR, or other sources, could be used for bioplastic research and innovation and the use of such products could be encouraged through higher standards in Public Procurement policies.

Bioplastics would benefit from independent testing and verification schemes, which set standards that are fit for purpose and specific to their intended use. Standards could be based on realistic environments, rather than laboratory controlled and optimised conditions, to assess degradability. Clear product labelling and making information publicly available on material and chemical composition, as well as appropriate disposal, can aid transparency and assist with determining risks and monitoring. The UK could align with similar proposals set out in the EU policy framework on biobased, biodegradable and compostable plastics⁴⁵². Further research is required into the short- and long-term environmental fate, persistence, ecotoxicology, and microplastic release profiles of biodegradable plastics^{453,454}.

Chewing gum

Chewing gum made from plastics acts as a direct source of microplastics entering the body through the digestive system. According to research a single piece can release over 250,000 microplastic particles during chewing⁴⁵⁵. US based research has reported similar numbers of microplastics released from synthetic and natural gums, although the origin of the plastic polymers detected in the studied natural gums remains uncertain and these findings should not be assumed to apply to all plastic-free products⁴⁵⁶.

As such, respondents suggested a ban or phasing out of plastic chewing gum, as well as health warnings and material ingredient labelling on packaging. Further, chewing gum could be made an age restricted item, with limits on point of sale locations, a plastic health tax, and public awareness and education campaigns.

Intentionally Added Microplastics (IAMS)

Intentionally added microplastics (IAMS) are manufactured and made as small solid plastic particles, deliberately included in products to perform a specific function. IAMS are incorporated across a range of applications including paints and coatings, decorations, cosmetics, infill materials such as in synthetic turf, industrial abrasives, detergents, personal care, cleaning, and agricultural products, such as controlled release fertilisers⁴⁵⁷.

Recommendations included mandatory monitoring, reporting, and enforcement, building on the success of the 2017 microbead ban and aligning with EU restrictions⁴⁵⁸ under REACH Regulations.

Specific recommendations were also given for plastic pellets and included legally binding, enforceable rules for every company that produces, handles, uses, packages, transports or stores pellets. These rules will require robust loss prevention measures, risk management, secure packaging and containment measures, mandatory staff training, independent certification and compliance, monitoring, annual public reporting of pellet losses, and incident response, clean-up and liability provisions. These regulations would apply to international carriers using UK ports and waters and cover all pellet handlers regardless of size. Adoption of the IMO Circular MEPC.1/Circ.909⁴⁵⁹ into UK policy, to align national standards with international efforts, was suggested to ensure that every stage of pellet handling at sea is governed by clear, preventative standards.

Food contact plastics

Food contact plastics provide a direct exposure route, with plastics releasing particles and leaching chemicals into food during processing and use⁴⁶⁰. Recommendations include mandating microplastic migration testing prior to placing food contact plastics on the market, which could be based on the EU's Food Contact Framework Regulation (EC) 1935/2004⁴⁶¹, and would require standardised protocols and best-practice methods for assessing microplastic release. To aid this it may be required to mandate manufacturer disclosure of plastic composition. Respondents went further to suggest phasing out all unnecessary plastics, especially single use, from food systems, including those used in takeaways, hot drinks, and grocery packaging. It was also suggested, for chewing gum as well as food contact plastics that the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment be involved in regulatory and public health reviews.

Packaging

Packaging was recognised as a priority sector due to the large volume of plastics produced for this market and its role in generating secondary microplastics, through fragmentation, littering, and inadequate end of life management.

Key approaches recommended by respondents included:

- Reducing plastic production and use, particularly single use plastics. This includes banning unnecessary packaging and extending restrictions to cover plastic lined paper packaging.
- Expanding and strengthening Extended Producer Responsibility (EPR) for packaging. EPR could:
 - Be eco-modulated to incentivise reuse, refill, and low shedding or non-plastic alternatives.
 - Exempt reusable packaging from fees while applying higher charges to packaging that is difficult to recycle or prone to fragmentation.
 - Ensure funds are returned to local authorities and NGOs for waste management, litter collection, and education.
- Strengthen the Plastic Packaging Tax by:
 - Increasing the tax rate to discourage plastic use.
 - Prohibit mass balance accounting for chemically recycled plastics that do not result in genuine material recycling.
- Prevent misleading material claims by prohibiting plastic content, including bioplastics, in products marketed as compostable. This will avoid contamination of organic waste streams.
- Improve design and transparency, including simplified packaging design, clearer material labelling, and full lifecycle approaches to reduce microplastic generation at end of life.

The approach to the packaging sector is rooted in upstream prevention with a focus on product redesign and polluter pays principles, rather than relying on consumer behaviour alone.

Recycling & Waste Management

Recycling and waste management systems contribute to microplastic pollution through fragmentation, illegal dumping and inappropriate recycling practices. This sector's approach could reframe recycling not as a solution but as a system re-designed to prevent microplastic leakage and redistribution.

Key approaches suggested include:

- Ban plastic waste exports, particularly to countries with high waste mismanagement risks, using powers available under the Environment Act 2021.
- Strengthen domestic recycling capacity, including:
 - Enforcing consistent processing standards.
 - Ensuring recycling systems do not redistribute persistent pollutants into soils or other environments.
- Exclude chemical recycling technologies (such as pyrolysis and gasification) from recycled content exemptions under the Plastic Packaging Tax, where they primarily produce fuels rather than recycled materials.
- Treat fly tipping and illegal dumping as microplastic pollution pathways, with stronger inspection, enforcement, and penalties, complemented by practical measures such as improving access to council waste facilities.
- Implement the UK Deposit Return Scheme (scheduled to launch in 2027⁴⁶²) in full and on time, recognising its role in preventing litter and plastic fragmentation. The use of reverse vending machines is an example of technology that supports the Deposit Return Scheme.
- Ensure EPR funding supports waste management infrastructure, including local authorities and community organisations engaged in litter prevention and education.

Textiles

Textiles were consistently identified as a high release sector, primarily due to microfibre shedding during wear, washing, and wastewater discharge.

Key approaches recommended include:

- Mandating microfibre filters on new washing machines, introduced through phased implementation and supported by:
 - National performance and testing standards (e.g. requiring capture of at least 80% of microfibrils).
 - Incentives for certified retrofit filters.
 - Public education on correct use and disposal, recognising end-of-life challenges for captured fibres.
- Increase the cover of Extended Producer Responsibility to textiles, encouraging reduction, reuse, and safer material choices.
- Strengthening textile design standards to prioritise durability, repairability, low-shedding performance, and the use of more bio-benign materials.
- Introduce standardised tests for microfibre shedding and require labelling to communicate sheddability and material composition to consumers.
- Strengthen controls on industrial textile wastewater, requiring effective filtration and monitoring of microfibre releases.
- Prevent pollution transfer through exports by establishing a regulatory presumption that all collected or donated synthetic textiles are waste.
- Adopt a whole-lifecycle approach, addressing both synthetic and naturally derived microfibrils and avoiding measures that merely shift pollution between systems.

Approaches taken by the textile sector could focus strongly on prevention at source and be supported by improvements in industry standards and producer responsibility.

Wastewater

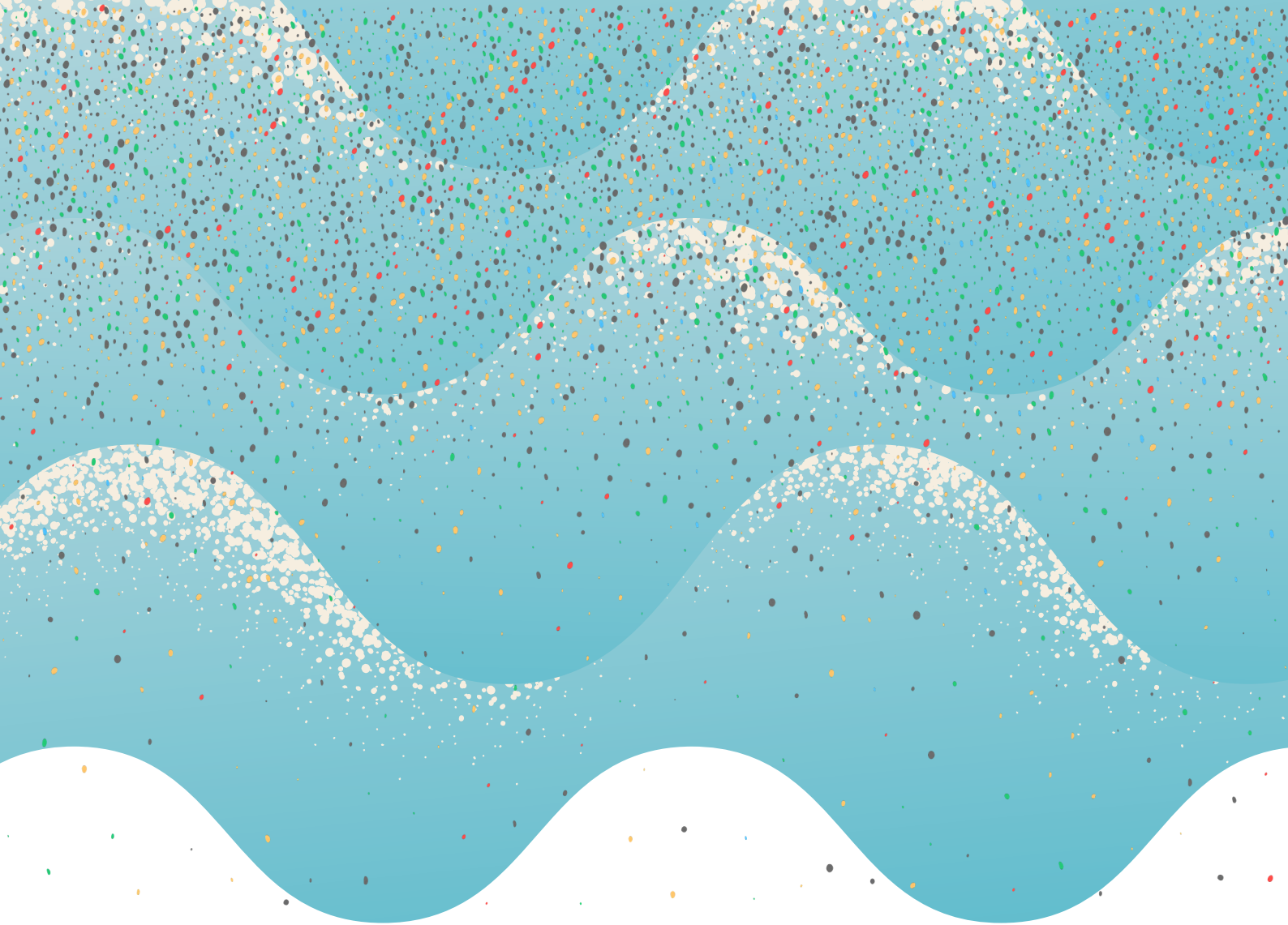
Wastewater systems are identified as both capture points and major redistribution pathways for microplastics.

Microplastic concentrations are particularly high in wastewater effluent, storm overflows, and in the sewage sludge applied to land^{463,464}.

Key approaches recommended include:

- Introducing microplastic-specific water quality standards in the UK, potentially within existing frameworks such as the Plan for Water or the 25-Year Environment Plan.
- Establishing national, standardised monitoring of microplastics across influent, effluent, sludge, soils, air, and receiving waters, including:
 - Accelerated implementation of BSI and ISO analytical standards.
 - Integration into river basin management plans, soil health assessments, and existing monitoring programmes.
 - Use of centralised, open-access databases for regulatory oversight and policy evaluation.
- Reform sewage sludge and biosolids regulation, including:
 - Bringing sludge treatment, storage, and land application under Environmental Permitting Regulations.
 - Expanding testing beyond heavy metals to include microplastics and other emerging contaminants.
 - Setting legally binding thresholds for microplastics, PFAS, and related pollutants.
 - Phasing out land application of biosolids until contamination is adequately monitored and controlled.
- Apply Extended Producer Responsibility to micropollutants, aligned with the revised EU Urban Wastewater Treatment Directive, ensuring producers contribute to the cost of advanced treatment.
- Address stormwater overflows and runoff, recognising these as acute microplastic release pathways.
- Conduct risk assessments of treatment infrastructure, including plastic bio-media, to minimise chemical and antimicrobial resistance risks.

The wastewater sector could take an approach that centres on upstream prevention and improvements in monitoring frameworks to ensure pollution is not simply shifted from water to land or food systems.



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