LEGAL FRAMEWORKS FOR AIRBORNE PLASTICS POLLUTION: A CRITICAL REVIEW AND RECOMMENDATIONS FOR THE UK REGULATION

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ABSTRACT

Plastic particles are infiltrating the air, posing an ever-growing threat to human health and ecosystems. While the world grapples with plastic pollution, the invisible danger of airborne microplastics has largely escaped public and policy attention. This Article critically and doctrinally examines the gap in the global legal framework for the regulations of airborne plastics pollution and its implications for the legal framework in the United Kingdom (UK). The Article scrutinizes the extant governance framework regulating plastic pollution such as the Plastic Packaging Tax, Extended Producer Responsibility, Deposit Return Schemes, and the Single-Use Plastics Directive to evaluate the prospect of airborne plastic regulation within these frameworks. Furthermore, the Article investigates the broader context of sustainable development, examining the alignment of microplastic policy with the Sustainable Development Goals and how this can offer an opportunity to develop airborne plastic regulation in the UK By incorporating technological innovations and considering the role of consumer behaviour, the Article offers recommendations like a ban or market-based regulation of synthetic fibres which is a major source of airborne plastic pollution in the UK This measure will enhance the effectiveness of extant policies and develop new strategies to combat this emerging environmental threat.

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INTRODUCTION

Every year, about 8 to 10 million metric tons of plastics enter the ocean and make up 80% of all marine pollution.[1] It has come to be a persistent environmental challenge with far-reaching effects on ecosystems, human health, and the actualization of Sustainable Development Goals (SDG).[2] The large-scale use of single-use plastics, coupled with the existence of inadequate waste management infrastructure and inefficient recycling practices, has aided in the widespread contamination of terrestrial and aquatic environments.[3] Owing to plastics' longevity and persistent use in the environment, the ecosystem continues to suffer.[4] However, an equally evasive yet overlooked issue threatens ecosystems and human health: airborne microplastics. While the focus has traditionally been on plastics in marine and terrestrial environments, there is a growing need to address the broader spectrum of plastic pollution, one of which airborne microplastics sit at its helm.[5] Evidence has shown that airborne microplastics not only pose

1. Marta Fava, *Ocean Plastic Pollution an Overview: Data and Statistics*, UNESCO (May 9, 2022), https://oceanliteracy.unesco.org/plastic-pollution-ocean/ [https://web.archive.org/web/20250315015545/https://oceanliteracy.unesco.org/plastic-pollution-ocean/]; Govind Singh Chauhan & Saba Wani, *Plastic Pollution: A Major Environmental Threat*, 6 INT'L J. INNOVATIVE RES. TECH. 43, 43 (2019); M. Aminur Rahman et al., *Plastic Pollutions in the Ocean: Their Sources, Causes, Effects and Control Measures*, 6 J. BIOLOGICAL STUD. 37 (2023); Ren-Shou Yu et al., *Global Analysis of Marine Plastics and Implications of Control Measure Strategies*, 10 FRONTIERS MARINE SCI., Dec. 10, 2023, at 1; S.B. Obebe & A.A. Adamu, *Plastic Pollution: Causes, Effects and Preventions*, 4 INT'L J. ENG'G APPLIED SCI. & TECH. 85, 85–95 (2020).

2. Rakesh Kumar et al., *Impacts of Plastic Pollution on Ecosystem Services, Sustainable Development Goals, and Need to Focus on Circular Economy and Policy Interventions*, SUSTAINABILITY, Sept. 6, 2021, at 1, 1–3.

3. Elaheh Daghighi et al., *The Forgotten Impacts of Plastic Contamination on Terrestrial Micro- and Mesofauna: A Call for Research*, 231 ENV'T RSCH., May 25, 2023, at 1, 2; Rakesh Kumar et al., *Impacts of Plastic Pollution on Ecosystem Services, Sustainable Development Goals, and Need to Focus on Circular Economy and Policy Interventions*, 13 SUSTAINABILITY, Sept. 6, 2021, at 1, 2.

4. Plastic contaminating the ecosystem is a pressing worldwide issue. *See* Boris Worm et al., *Plastic as a Persistent Marine Pollutant*, 42 ANN. REV. ENV'T & RES., 2017, at 1, 9–10; Janice Brahney et al., *Plastic Rain in Protected Areas of the United States*, 368 SCI. 1257, 1257 (2020).

5. Karen Duis & Anja Coors, *Microplastics in the Aquatic and Terrestrial Environment: Sources (with a Specific Focus on Personal Care Products), Fate and Effects*, 28 ENV'T SCI. EUR., 2016,

risks to the respiratory health of humans but can also affect climate patterns by way of acting as cloud condensation nuclei.[6] In the United Kingdom (UK), where plastic pollution policies have their primary focus on terrestrial and marine systems, there is an impending need to expand these regulatory efforts to include airborne pathways. This Article provides a doctrinal assessment of the legal frameworks that address airborne plastic pollution in the UK

Airborne plastics introduce a new and critical aspect to the atmospheric pollution crisis, and how it impacts public health and the environment.[7] Recent studies have shown that microplastics, which are derived from the breakdown of larger plastic items, can become suspended in the air and travel over long distances.[8] This raises concerns about the inhalation of microplastics by humans and animals, which is likely to affect them and their environment.[9] Addressing this issue is important to safeguard the integrity of the environment and public health.[10] The interconnectedness of terrestrial, aquatic, and atmospheric systems demands that a comprehensive approach to plastic pollution governance should include the airborne component, which has been largely overlooked in the existing framework. Evidence of various types of microplastics in cloud water samples collected at high altitudes show their potential influence on cloud formation and climate patterns.[11] This underscores the pressing need for the development of strategies that would address the issue of microplastic pollution and its potential impacts on climate and human health. Reducing plastic waste at the sources can significantly reduce the amount of plastic that enters marine

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at 1, 8; Steve Allen et al., *Atmospheric Transport and Deposition of Microplastics in a Remote Mountain Catchment*, 12 NATURE GEOSCIENCE 339, 340 (2019).

6. Stephanie L. Wright & Frank J. Kelly, *Plastic and Human Health: A Micro Issue?*, 51 ENV'T SCI. & TECH. 6634, 6636 (2017); Yize Wang et al., *Airborne Hydrophilic Microplastic in Cloud Water at High Altitudes and Their Role in Cloud Formation*, 21 ENV'T CHEMISTRY LETTERS 3055, 3056 (2023).

7. Joana C. Prata et al., *Airborne Microplastics: Concerns Over Public Health and Environmental Impacts*, *in* HANDBOOK OF MICROPLASTICS IN THE ENVIRONMENT 177, 179–80 (T. Rocha-Santos et al. eds., 2022).

8. Fatima Haque & Chihhao Fan, *Fate and Impacts of Microplastics in the Environment: Hydrosphere, Pedosphere, and Atmosphere*, 10 ENV'T'S, Apr. 24, 2023, at 1, 4; Miri Trainic et al., *Airborne Microplastic Particles Detected in the Remote Marine Atmosphere*, COMMC'NS EARTH & ENV'T, 2020, at 1, 4; Shoulin Xiao et al., *Long-distance Atmospheric Transport of Microplastic Fibres Influenced by Their Shapes*, 16 NATURE GEOSCIENCE 863, 863 (2023).

9. Z. Yang et al., *Human Microplastics Exposure and Potential Health Risks to Target Organs by Different Routes: A Review*, 9 CURR. POLLUTION REPS. 468, 480 (2023).

10. Shampa Ghosh et al., *Microplastics as an Emerging Threat to the Global Environment and Human Health*, SUSTAINABILITY, July 10, 2023, at 1, 7; Joana C. Prata et al., *A One Health Perspective of the Impacts of Microplastics on Animal, Human and Environmental Health*, 771 SCI. TOTAL ENV'T, 2021, at 1, 5.

11. Yize Wang et al., *Airborne Hydrophilic Microplastic in Cloud Water at High Altitudes and Their Role in Cloud Formation*, 21 ENV'T CHEMISTRY LETTERS 3055, 3056–57 (2023).

environments and, subsequently, the atmosphere. Devising and enforcing laws and policies to prevent sources of airborne plastic pollution can reduce the generation and impact of airborne microplastics.

The precautionary principle in Principle 15 of the Rio Declaration is a cornerstone of environmental policy which advocates for action in the face of uncertainty to prevent potential harm.[12] This principle is very relevant in the bid to address airborne microplastics and their threat to ecosystems and human health. While the development of practical methods that would directly remove microplastics from the marine environment still appears to be a problem,[13] the precautionary principle would take up a proactive approach that will primarily focus on prevention rather than reduction. The UK regulatory policies can significantly reduce the release of microplastics into the environment by trying to implement stricter plastic pollution regulation.[14] This would help in mitigating their impact on human health and ecosystems.[15] Alternatively, the adaptation of a better product design that makes use of sustainable materials can offer a complementary approach to prevention.[16] While some remediation techniques, such as filtration and bioremediation, have shown promise, their effectiveness is limited and expensive.[17]

The purpose of this research is to conduct an innovative evaluation of airborne plastic pollution regulation and waste management practices, with a specific focus on airborne plastics in the UK After the general introduction, Part I begins with a comparative overview of airborne plastic pollution.[18] This Part shows how airborne plastics emerge from sources like synthetic fibres and microplastic fragmentation and examines comparative governance

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12. Jeffrey D. Kovar, *A Short Guide to the Rio Declaration*, 4 COLO. J. INT'L ENV'T L. & POL'Y 119, 134 (1993); Xun Wu et al., *Beyond Precautionary Principle: Policy Making Under Uncertainty and Complexity*, 7 POL'Y DESIGN & PRAC., 2024, at 1, 1–2.

13. Currently, there are no practical methods for directly removing uPs from the marine environment. *See* Sina Pourebrahimi & Majid Pirooz, *Microplastic Pollution in the Marine Environment: A Review*, 10 J. HAZARDOUS MATERIALS ADVANCES, 2023, at 1, 7.

14. *Cf.* João Pinto da Costa et al., *The Role of Legislation, Regulatory Initiatives and Guidelines on the Control of Plastic Pollution*, 8 FRONTIERS ENV'T SCI., July 24, 2020, at 1, 2; Sunusi Usman et al., *The Burden of Microplastics Pollution and Contending Policies and Regulations*, 19 INT'L J. ENV'T RSCH. & PUB. HEALTH, June 1, 2022, at 1, 8.

15. Joana C. Prata, *Airborne Microplastics: Consequences to Human Health?*, 234 ENV'T POLLUTION 115, 117 (2018).

16. Denise M. Mitrano & Wendel Wohlleben, *Microplastic Regulation Should be More Precise to Incentivize Both Innovation and Environmental Safety*, 11 NATURE COMMC'NS, 2020, at 1, 9.

17. Charu Thapliyal et al., *Potential Strategies for Bioremediation of Microplastic Contaminated Soil*, 6 ENV'T CHEMISTRY & ECOTOXICOLOGY 117, 126 (2024).

18. *See generally* Sen Wang, *International Law-Making Process of Combating Plastic Pollution: Status Quo, Debates and Prospects*, 147 MARINE POL'Y, 2023, at 1, 1 (outlining current developments in legal frameworks addressing plastic pollution).

approaches across regions, including the European Union (EU), North America, and Southeast Asia. It underscores the challenges posed by airborne plastics, including their health risks and lack of targeted regulations.[19] Part II focuses on the domestic legal framework of the UK, critically analysing policies such as the Plastic Packaging Tax, Extended Producer Responsibility, and the proposed Deposit Return Schemes.[20] It assesses their effectiveness in addressing airborne plastics, highlighting their indirect impact, and the need for specific policies targeting airborne microplastics.[21] Part III extends the discussion to EU regulations, which includes directives like the Packaging and Packaging Waste Directive and the Single-Use Plastics Directive. The Article identifies how these initiatives fail to address the unique challenges posed by airborne microplastics, despite being comprehensive for general plastic pollution. In Part IV, the Article evaluates global legal instruments, such as the Basel and Stockholm Conventions, and the upcoming Global Plastics Treaty, with emphasis on marine and terrestrial plastic pollution rather than airborne microplastics. It critiques the absence of international agreements that directly address airborne plastics, showing the need for a dedicated framework.

The Article then explores the relationship between airborne plastics, technology, and SDGs in Part V. It discusses the role of innovations like air filtration systems, sustainable materials, and microplastic detection technologies in mitigating airborne plastic pollution.[22] These align with specific SDGs, such as SDG 11 (Sustainable Cities and Communities) and SDG 15 (Life on Land), showcasing how sustainable practices can address this environmental challenge. Part VI identifies regulatory gaps and challenges, showcasing issues such as the lack of standardized monitoring, cross-boundary complexities, and weak enforcement. This Part argues that while existing regulations provide a foundation, they are inadequate for addressing the nuanced risks of airborne plastics.[23] In Part VII, the study

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19. Luís Fernando Amato-Lourenço et al., *Presence of Airborne Microplastics in Human Lung Tissue*, 416 J. HAZARDOUS MATERIAL, 2021, at 1, 4.

20. Brindha Ramasubramanian et al., *Recent Advances in Extended Producer Responsibility Initiatives for Plastic Waste Management in Germany and UK*, 5 MATERIALS CIRCULAR ECON., 2023, at 1, 6.

21. *See generally* A SEMADENI DAVIES ET AL., DETERMINING THE ECOLOGICAL AND AIR QUALITY IMPACTS OF PARTICULATE MATTER FROM BRAKE AND TYRE WEAR AND ROAD SURFACE DUST (2021).

22. *See generally* SAPEA, A SCIENTIFIC PERSPECTIVE ON MICROPLASTICS IN NATURE AND SOCIETY (2019) (Science Advice for Policy by European Academies 2019) (discussing technological innovations including air filtration systems, sustainable materials, and microplastic detection technologies for addressing microplastic pollution).

23. P. Villarrubia-Gómez et al., Identifying and Overcoming Social-Ecological Barriers to Ending Plastics Pollution (May 27, 2025) (unpublished manuscript) (on file with EarthArXiv).

focuses on the case against synthetic fibres and fragments, identifying them as the major source of airborne microplastics in the UK—greater than 90%, as evidenced by Birmingham-based research.[24] This Part proposes a targeted intervention that includes bans, market-based instruments like taxes, and incentives to shift towards sustainable alternatives, which could significantly mitigate airborne microplastic pollution. The Article concludes by offering recommendations for the effective regulation of airborne plastics in the UK These include implementing a ban or market-based regulation on synthetic fibres, creating a robust legal framework specifically addressing airborne microplastics, and encouraging technological and behavioural innovations.[25] Such measures are essential for tackling this emerging environmental threat while aligning with sustainable development objectives.

I. AIRBORNE PLASTICS GOVERNANCE – COMPARATIVE OVERVIEW

Microplastics, which measure less than 5 mm in size,[26] and nanoplastics, with an approximate range of about 1 to 100 nm (0.001–0.1 μm), present significant environmental challenges due to their small dimensions and widespread presence.[27] The current technological limitations that exist hinder the detection and removal of these microplastics from the environment.[28] These particles are widespread as they can be found across the ecosystem, which includes marine, terrestrial, and atmospheric environments.[29] They emanate from sources like the degradation of macroplastics, microbeads in consumer products, synthetic textile fibres, and industrial activities.[30] The diversity of these sources complicates the regulatory efforts that are channelled towards the mitigation of their release into the environment. Also,

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24. Hassan Khalid Ageel et al., *Microplastics in Indoor Air from Birmingham, UK: Implications for Inhalation Exposure*, 362 ENV'T POLLUTION, 2024, at 1.

25. *See generally* Davi R. Munhoz et al., *Microplastics: A Review of Policies and Responses*, 2 MICROPLASTICS, Dec. 23, 2022, at 1, 1 (providing an overview of legal frameworks addressing microplastics).

26. *Id.*; Fanny Caputo et al., *Measuring Particle Size Distribution and Mass Concentration of Nanoplastics and Microplastics: Addressing Some Analytical Challenges in the Sub-Micron Size Range*, 588 J. COLLOID & INTERFACE SCI. 401, 402 (2021).

27. *See generally* ESFA CONTAM Panel, *Presence of Microplastics and Nanoplastics in Food, with Particular Focus on Seafood*, 14 EFSA J., May 11, 2016, at 1 (explaining the presence of microplastics and nanoplastics in the food chain); *see also* Hassan Khalid Amobonye et al., *Environmental Impacts of Microplastics and Nanoplastics: A Current Overview*, 12 FRONTIERS MICROBIOLOGY, 2021, at 1.

28. *Id.*; *see also* Thuhin K. Dey et al., *Detection and Removal of Microplastics in Wastewater: Evolution and Impact*, 28 ENV'T SCI. & POLLUTION RSCH., 2021, at 1.

29. Karen Duis & Anja Coors, *supra* note 5, at 9–12.

30. Rajul Jain et al., *Microplastic Pollution: Understanding Microbial Degradation and Strategies for Pollutant Reduction*, 905 SCI. TOTAL ENV'T, Sept. 17, 2023, at 1, 2.

the processes associated with the production, packaging, and transportation of plastic products play a huge role in its dispersion into the environment.[31]

The increasing prevalence of microplastics in the environment poses a significant threat to human health in the United Kingdom (UK) and globally. These particles, especially those that are less than 10 micrometres in size, are inhaled, ingested, and absorbed through dermal exposure.[32] The ones that are below 2.5 micrometres are of particular concern owing to their ability to bypass pulmonary defences, thereby entering the bloodstream via the respiratory pathways.[33] The inhalation of these microplastics allows them to penetrate the respiratory system, which inadvertently causes inflammation, irritation, and long-term damage to lung tissue.[34] Studies have linked microplastic exposure to respiratory diseases such as asthma, bronchitis, and chronic obstructive pulmonary disease.[35] Moreover, microplastics can impair lung function, reducing lung capacity and increasing the risk of respiratory distress.[36] Microplastics interact with the immune system, potentially compromising its ability to fight off infections and diseases. This leaves individuals more susceptible to illness and increases the severity of infections. Additionally, they even trigger allergic reactions in some people.[37] Currently, emerging research suggests that microplastics pose risks to reproductive health.[38] Some of these microplastics contain chemicals that disrupt the endocrine system, potentially affecting hormone levels and reproductive function.[39] This highlights the growing concern regarding the potential impact of microplastics on fertility and reproductive outcomes.

Beyond their impact on human health, airborne microplastics also pose significant risks to ecosystems. The deposition of these particles on land and in water disrupts biodiversity, harms wildlife, and contaminates food

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31. Sina Pourebrahimi & Majid Pirooz, *Microplastic Pollution in the Marine Environment: A Review*, 10 J. HAZARDOUS MATERIALS ADV., May 2023, at 1, 3–4.

32. Simon Ducroquet & Shannon Osaka, *The Plastics We Breathe*, WASH. POST (June 10, 2024), https://www.washingtonpost.com/climate-environment/interactive/2024/microplastics-air-human-body-organs-spread.

33. *Id.*

34. Suvash Saha & Goutam Saha, *Effect of Microplastics Deposition on Human Lung Airways: A Review with Computational Benefits and Challenges*, 10 HELIYON, Jan. 30, 2023, at 1, 3.

35. Kuo Lu et al., *Microplastics, Potential Threat to Patients with Lung Diseases*, 4 FRONTIERS TOXICOLOGY, Sept. 28, 2022, at 1, 4.

36. *Id.*

37. Qi Han et al., *Co-exposure to Polystyrene Microplastics and Di-(2-ethylhexyl) Phthalate Aggravates Allergic Asthma Through the TRPA1-p38 MAPK Pathway*, 384 TOXICOLOGY LETTERS 73, 84 (2023).

38. Mei Wang et al., *The Hidden Threat: Unraveling the Impact of Microplastics on Reproductive Health*, 935 SCI. TOTAL ENV'T, May 13, 2024, at 1, 6.

39. Sana Ullah et al., *A Review of the Endocrine Disrupting Effects of Micro and Nano Plastic and Their Associated Chemicals in Mammals*, 13 FRONTIERS ENDOCRINOLOGY, Jan. 16, 2023, at 1.

chains.[40] Microplastics can be ingested by animals, leading to digestive problems, reproductive issues, and even death.[41] Additionally, the accumulation of microplastics in ecosystems can disrupt nutrient cycles and alter food webs, with cascading effects on the entire ecosystem.[42]

The complex nature of airborne microplastics, coupled with the lack of standardized monitoring and measurement methods, poses significant challenges for regulators. Understanding the sources, pathways, and impacts of microplastics requires extensive research and scientific investigation.[43] Developing effective regulations and mitigation strategies necessitates a comprehensive understanding of the risks posed by airborne microplastics and the most effective approaches to address them. For instance, the provision of clear-cut thresholds and guidelines for microplastic control and removal would improve general understanding.[44] One of the challenges in establishing a specific legal framework for airborne microplastics is the need for comprehensive research to understand the sources, pathways, and potential impacts on human health and the environment.[45] Scientific knowledge is essential for informing effective regulatory measures aimed at regulating airborne plastics.

International cooperation is a possible avenue in addressing the global challenge of plastic pollution, particularly airborne microplastics. While efforts to regulate plastic pollution have primarily focused on marine and terrestrial environments, a growing number of countries and regions are recognizing the importance of addressing airborne plastics. The European Union (EU), for example, has taken significant strides in reducing plastic waste through initiatives like the Single-Use Plastics Directive.[46] The EU has also set targets to make all plastic packaging recyclable by 2030 and reduce

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40. Meysam Saeedi, *How Microplastics Interact with Food Chain: A Short Overview of Fate and Impacts*, 61 J. FOOD SCI. & TECH. 403, 411 (2024); Ranjit Singh et al., *The Web of Life: Role of Pollution in Biodiversity Decline*, 10 INT'L J. FAUNA & BIOLOGICAL STUD. 49, 50 (2023).

41. For instance, microplastics in water can be sucked by shellfish, plankton, and floating algae. Eunju Jeong et al., *Animal Exposure to Microplastics and Health Effects: A Review*, 10 EMERGING CONTAMINANTS, May 14, 2024, at 1.

42. *See* Rogers W. Chia et al., *Microplastic Pollution in Soil and Groundwater: A Review*, 19 ENV'T CHEMISTRY LETTERS, Aug. 24, 2021, at 1, 3; *see* Jihye Cha et al., *Microplastics Contamination and Characteristics of Agricultural Groundwater in Haean Basin of Korea*, 864 SCI. TOTAL ENV'T, Mar. 15, 2023, at 1, 2.

43. Chelsea M. Rochman, *Microplastics Research—From Sink to Source*, 360 SCI. 28, 28 (2018).

44. Yu-Ning Chen et al., *Monitoring, Control and Assessment of Microplastics in Bioenvironmental Systems*, 32 ENV'T TECH. & INNOVATION., Nov. 2023, at 1, 15.

45. G. Lamichhane et al., *Microplastics in the Environment: Global Concern, Challenges, and Controlling Measures*, 20 INT'L J. ENV'T SCI. & TECH., May 2022, at 1, 2.

46. Valentina Beghetto et al., *Plastics Today: Key Challenges and EU Strategies Towards Carbon Neutrality: A Review*, 334 ENV'T POLLUTION., Oct. 1, 2023, at 1, 6.

consumption of single-use plastics.[47] This measure will support the reduction of single-use plastic, which upon degeneration can transform into airborne plastic.

Comparatively, North American countries are dynamically addressing the issue of airborne plastic pollution through a combination of policies and regulations targeting the various sources of airborne plastic. The United States is committed to combating plastic pollution both domestically and internationally. This is seen in various national programs such as the National Recycling Strategy, which aims to increase the US recycling rate to 50% by 2030.[48] In addition, Sustainable Materials Management (SMM), promotes efficient use of materials throughout their lifecycle.[49] There is also the WasteWise Program, which assists businesses and organizations in reducing waste and promoting sustainability.[50] In Canada, the Canadian Environmental Protection Act (CEPA) provides the legal framework for regulating substances that are harmful to the environment, which should extend to include microplastics.[51] Several Canadian provinces and municipalities have implemented bans on single-use plastic bags to reduce plastic waste.[52] Mexico's plastic strategy is seen in the collection of legislation to reduce plastic pollution and promote sustainable consumption.[53] Mexico has implemented regulations to ban or restrict certain single-use plastic items, such as straws and bags.[54]

Asia, particularly Southeast Asia, presents a complex picture. Countries like China, South Korea,[55] and Japan have implemented various policies to

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47. European Commission Press Release IP/18/5, Plastic Waste: A European Strategy to Protect the Planet, Defend Our Citizens and Empower Our Industries (Jan. 15, 2018).

48. Press Release, Off. of the Spokesperson, U.S. Dep't. of State, U.S. Actions to Address Plastic Pollution, (Feb. 28, 2022).

49. Chia-Nan Wang et al., *An Information System for Sustainable Materials Management with Material Flow Accounting and Waste Input–Output Analysis*, 27 SUSTAINABLE ENV'T RSCH. 135, 135 (2017).

50. *WasteWise*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/smm/wastewise (last updated Feb. 15, 2024) [https://web.archive.org/web/20250202001632/https://www.epa.gov/smm/wastewise].

51. Canadian Environmental Protection Act 1999, S.C. 1999, c 33 (Can.).

52. Emily Chung, *For Cities and Towns Trying to Cut Out Plastic, Here's What's Worked and What Hasn't*, CBC NEWS (May 7, 2024), https://www.cbc.ca/news/canada/plastic-bans-by-city-town-1.7196086.

53. This is due to the existence of four national regulations, twenty state laws, twenty-six municipal laws, and four official norms. *See* MADISON GRIFFIN & RACHEL KARASIK, DUKE UNIV.: NAT'L INST. FOR ENV'T POL'Y SOLUTIONS, PLASTIC POLLUTION POLICY SPOTLIGHT: MEXICO 1–2 (2022).

54. Brandon Wiggins & Erica Sanchez, *Mexico City's Ban on Plastic Bags Officially Takes Effect*, GLOBAL CITIZEN (Jan. 2, 2020), https://www.globalcitizen.org/en/content/mexico-city-plastic-bag-ban/.

55. *See, e.g.*, Yong-Chul Jang et al., *Recycling and Management Practices of Plastic Packaging Waste Towards a Circular Economy in South Korea*, 158 RES., CONSERVATION & RECYCLING, Mar. 2020, at 1, 2.

address plastic pollution, which focus on recycling and waste management.[56] However, the rapid industrialization and urbanization in the region have also led to increased plastic consumption and waste generation. Southeast Asian nations, grappling with challenges such as poverty and lack of infrastructure, face unique obstacles in managing plastic waste, including airborne microplastics.[57]

Africa, with its diverse environmental and socioeconomic conditions, offers a different perspective. Many African countries are still developing their waste management systems and plastic pollution. While some efforts are underway to address plastic waste, the continent contends with significant challenges regarding resources, infrastructure, and capacity building.[58]

While the UK has made strides in addressing plastic pollution, the specific legal framework for airborne microplastics has not been developed.[59] Relatable regulations and policies remain outdated and underdeveloped. The primary focus of existing legislation has been on managing plastic waste and reducing plastic consumption.[60] Key legislative frameworks include the Environmental Protection Act of 1990, which provides a broad environmental protection framework but lacks specific provisions for airborne microplastics.[61] The Waste Management Regulations cover waste collection, treatment, and disposal, including plastic waste, but primarily address land-based and aquatic pollution.[62]

Although common law principles like nuisance and negligence could potentially be applied to address airborne microplastics-related harm, their effectiveness remains untested and uncertain. Regulatory bodies such as the Environment Agency play a big part in environmental protection but may lack specific mandates for airborne microplastics.[63] The challenges associated with monitoring, measuring, and regulating these tiny particles

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56. Huijuan Hao & Chenfan Jiang, *The Path of Transboundary Marine Plastic Waste Management in China, Japan, and South Korea from the Perspective of the Blue Economy*, 9 FRONTIERS MARINE. SCI., Jan. 24, 2023, at 1, 3.

57. Bhumika Das et al., *Plastic Pollution in South and Southeast Asia: Challenges and Sustainable Solutions*, 36 LAND DEGRADATION & DEV., June 2025, at 1, 2.

58. Issahaku Adam et al., *Policies to Reduce Single-use Plastic Marine Pollution in West Africa*, 116 MARINE POL'Y, Mar. 2020, at 1, 1–2.

59. Imperial College London, *Understanding UK Airborne Microplastic Pollution*, UK RSCH. & INNOVATION, https://gtr.ukri.org/projects?ref=NE%2FT007605%2F1 (last visited Apr. 9, 2026).

60. LOUISE SMITH, PLASTIC WASTE 23–30 (House of Commons Library 2024).

61. Esther Kentin & Heidi Kaarto, *An EU Ban on Microplastics in Cosmetic Products and the Right to Regulate*, 27 REV. EUR., COMPAR. & INT'L ENV'T L. 254, 257 (2018).

62. David Shiers et al., *Implementing New EU Environmental Law: The Short Life of the UK Site Waste Management Plan Regulations*, 57 J. ENV'T PLAN. & MGMT., 2014, at 1, 2.

63. ENV'T AGENCY, REVIEW OF ACTIVITIES REGULATED BY THE ENVIRONMENT AGENCY, 2022, at 41 (2024).

further complicates the development of a robust legal framework.[64] The UK's legal framework for airborne microplastics will be examined in greater detail in subsequent Parts of this Article.

II. LEGAL FRAMEWORK IN THE UNITED KINGDOM

The legal framework in the United Kingdom (UK) plays a pivotal role in addressing the complex challenges of plastic pollution and waste management. Operating at the national level, the UK has proactively implemented diverse legislative measures and regulatory initiatives explicitly designed to mitigate the environmental impact of plastics. This somewhat underscores the UK's commitment to fostering sustainable practices and ensuring the responsible management of plastic waste throughout its life cycle. The UK retained much of its waste legislation from the European Union (EU) after it departed (Brexit).[65]

One key aspect of the UK's legal framework is its regulations targeting single-use plastics.[66] These regulations reflect a concerted effort to curb the pervasive use of disposable plastic items, a significant contributor to environmental pollution.[67] Concurrently, the legal framework addresses waste management practices, emphasizing the need for efficient collection, recycling, and disposal mechanisms.[68] This method recognizes the interconnectedness of plastic production, consumption, and disposal, and seeks to holistically address each stage of the plastic life cycle.[69] Some key legal instruments applicable in the UK in plastic pollution are discussed below.

A. Plastic Packaging Tax

The UK-wide Plastic Packaging Tax (PPT), implemented on April 1, 2022, offers an intervention approach targeted towards addressing plastic pollution by promoting the adoption of recycled plastic materials.[70] This tax,

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64. Jesus Gago et al., *Microplastics Pollution and Regulation*, *in* HANDBOOK OF MICROPLASTICS IN THE ENVIRONMENT 1, 11, 17 (T. Rocha-Santos et al. eds., 2020).

65. The EU (Withdrawal) Act 2018 allowed the UK to convert existing EU laws into domestic laws and maintain consistency until the UK government decides to amend or repeal them. European Union (Withdrawal) Act 2018, cl. 16, § 2 (UK).

66. Riley Schnurr et al., *Reducing Marine Pollution from Single-Use Plastics (SUPs): A Review*, 137 MARINE POLLUTION BULL. 157, 162 (2018).

67. *Id.*

68. Tobias D. Nielsen et al., *Politics and the Plastic Crisis: A Review Throughout the Plastic Life Cycle*, 9 WIREs ENERGY & ENV'T, Aug. 8, 2019, at 1, 4.

69. *Id.*

70. Ramasubramanian, *supra* note 20; *see* Finance Act 2021, SS 47 (UK).

which is governed under the Finance Act of 2021, imposes a financial charge on businesses producing or importing components of plastic packaging that have less than 30% recycled content.[71] The rate, as of 2024, stands at £217.85 per metric tonne, which shows the annual increases aimed at maintaining the effects of the deterrent policy.[72] In theory, the tax encourages a shift toward a more sustainable practice that aligns with circular economy principles just by excluding packaging with higher recycled content. Though tax creates a direct economic incentive that helps in the reduction of virgin plastic use, its effectiveness is highly dependent on its implementation and compliance. Businesses are mandated to keep a detailed record of the weight and composition of plastic packaging, which leads to extra administrative burdens.[73] Due to the dependency on self-reporting, there is a large risk of underreporting or noncompliance.[74] Furthermore, the focus of the tax on packaging and composition may fail to look at the broader systemic challenges.[75] Additionally, unintended loopholes may be created if, in the classification criteria, the tax status in a composite component is determined by the heaviest material in it.[76] Although the policy is a positive step, it falls short in addressing the adverse environmental consequences inherent in the lifetime of plastic packaging, as well as the upstream factors that drive plastic production.

The PPT (Descriptions of Products) Regulations 2021 refine the criteria for packaging components to enhance the precision in tax and feedback of

71. SMITH, *supra* note 60, at 30.

72. HM Revenue and Customs, *Plastic Packaging Tax: Steps to Take*, GOV.UK (Jan. 2, 2024), https://www.gov.uk/guidance/check-if-you-need-to-register-for-plastic-packaging-tax.

73. The exemption for businesses manufacturing or importing less than ten tonnes of plastic packaging in a 12-month period acknowledges the potential burden on small enterprises, promoting fairness and practicality. *Id.*

74. Celia Somlai et al., *Plastic Packaging Waste in Europe: Addressing Methodological Challenges in Recording and Reporting*, 41 WASTE MGMT. & RSCH. 1188, 1196–1198 (2023). The article notes that producer reporting systems are vulnerable to "freeriding, non-compliance and de minimis" practices and that producers may have financial incentives for under-reporting. *Id.*

75. Exemptions for packaging used as immediate packaging for licensed human medicines and for transport packaging for imports and exports recognize specific needs and necessities, avoiding unintended consequences on critical sectors. *See Plastic Packaging Tax – What You Need to Know*, HERBERT SMITH FREEHILLS LLP (Feb. 14, 2022), https://www.herbertsmithfreehills.com/insights/2022-02/plastic-packaging-tax-%E2%80%93-what-you-need-to-know. However, a narrow focus on tax-based composition requirements may overlook broader systemic challenges such as the lack of integrated recycling infrastructure and the risk of *material switching* to alternatives with higher lifecycle carbon costs. *Cf.* Bhumika Das et al., *Plastic Pollution in South and Southeast Asia: Challenges and Sustainable Solutions*, 36 LAND DEGRADATION & DEV., 2025, at 1, 12 (emphasizing that sustainable solutions require holistic waste management frameworks beyond mere fiscal intervention).

76. HM TREASURY PLASTIC POLLUTION TAX: CONSULTATION, cl. 3 ¶ 3.17 (OGL 2019) (UK).

the address industry.[77] The regulations target items that have a higher environmental impact by excluding products such as storage-functional packaging, integral components of goods, and reusable packaging.[78] However, the regulation tries to recognize the limited pollution contribution of certain excluded items.[79] The inclusion of single-use products which serves the function of packaging at the consumer level expands how the tax is applied, thereby showing the intention to reduce sources of plastic waste that are hardly paid attention to.[80]

The aim of the PPT is to reduce plastic waste and promote recycling, but it also indirectly contributes to the mitigation of airborne plastics. The policy encourages the adoption of a sustainable practice that includes the increased use of recycled materials through its tax imposition on plastic packaging that has less than 30% recycled content.[81] When the demand for virgin plastic production reduces, there is a likelihood it may lower the overall plastic consumption, which also reduces how much microplastic is generated.[82] However, the PPT does not specifically address airborne microplastic sources or target the broader lifecycle processes that aid in microplastic release into the environment.

The PPT has led to a measurable increase in the use of recycled plastic in packaging, thereby fulfilling some of its environmental objectives.[83] However, its economic and operational implications are important. Businesses have redefined their supply chains, which has led to less reliance on UK-based operations.[84] The PPT has also impacted the domestic industry

77. Enacted by the Treasury, in the exercise of the powers conferred by sections 48(5), 63(1) and 84(3) of the Finance Act 2021. 2021 c. 26. Part 2 was commenced by the Finance Act 2021, Part 2 etc. (Plastic Packaging Tax) (Appointed Day) Regulations 2021 (S.I. 2021/1409 (C. 79)) for the purpose of making any regulations under that Part with effect from December 10, 2021. *See* The Plastic Packaging Tax (Descriptions of Products) Regulations 2021, SI 2021/1417 reg. 4(1) (UK); Henna Jylhä et al., *A Novel Method of Accounting for Plastic Packaging Waste*, 196 WASTE MGMT. 42, 43 (2025).

78. The Plastic Packaging Tax (Descriptions of Products) Regulations 2021, SI 2021/1417, reg. 3–4 (UK).

79. *See* The Plastic Packaging Tax (Descriptions of Products) Regulations 2021, SI 2021/1417, reg. 4(2) (UK).

80. The Plastic Packaging Tax (Descriptions of Products) Regulations 2021, SI 2021/1417, reg. 5(2)(a) (UK).

81. Finance Act 2021, Ss 47(1)(a) (UK).

82. Joakim Larsson, Automated Central Sorting of Plastic Packaging Waste – A Qualitative Study of Drivers, Barriers and Possible Solutions for Implementing Automated Central Sorting of Plastic Packaging Waste in Sweden 10 (2020) (Master thesis, Uppsala University) (on file with Department of Earth Sciences).

83. Andrew Dove et al., *Promoting the Use of Recycled Plastics: A Taxing Issue*, 27 ENV'T L. REV. 42, 45 (2025).

84. *Id*.

by way of lowering demand for storage and haulage services.[85] There are inefficiencies in the implementation of PPT which is shown by the decline in its revenue despite an increased tax rate and a rise in the number of registered businesses. While the intensified efforts of His Majesty's Revenue and Customs (HMRC) have improved registration rates, the total number of registered businesses remains below projections, which indicates a persistent issue of compliance.[86] These dynamics show the need for better regulatory oversight and enforcement mechanisms to achieve the dual environmental and economic goals of the tax.

The UK's PPT has undergone a notable evolution in its enforcement strategy.[87] Initially, HMRC adopted a 'soft-landing' approach, providing support and guidance to taxpayers as they adjusted to the new tax regime. This cooperative stance facilitated a smoother transition and encouraged voluntary compliance. However, the landscape has shifted with the introduction of a more stringent penalty regime. Standard penalties for common tax offences, such as late payment and inaccurate returns, have been extended to cover the PPT.[88] Moreover, the tax authority has introduced specific penalties tailored to the unique challenges of administering the PPT, such as those for failure to maintain adequate records.[89]

Businesses that fail to register for the PPT, or register late, face financial penalties calculated as a percentage of the potential lost revenue.[90] Factors such as the reason for noncompliance and the level of cooperation with HMRC will influence the penalty amount. In severe cases, criminal charges may apply. Penalties for criminal offences include imprisonment of up to 12 months (6 months in Northern Ireland) and financial penalties of up to £20,000 or triple the amount of unpaid tax.[91] Submitting returns late or failing to submit them altogether results in financial penalties.[92] The penalty amount

85. Abigail McGregor, *UK Plastic Packaging Tax Data Shows Environmental and Economic Impact*, PINSENT MASONS (Aug. 16, 2024), https://www.pinsentmasons.com/out-law/news/plastic-packaging-tax-data-environmental-economic-impact.

86. The revenue collected from the Plastic Packaging Tax decreased from £285 million in 2022–2023 to £268 million in 2023–2024, representing a 6% decline. *Id.*

87. Richard O'Doherty et al., *Regulatory Failure via Market Evolution: The Case of UK Packaging Recycling*, 21 ENV'T & PLAN. C: GOV'T & POL'Y 579, 579 (2003).

88. Ian Bailey, *Principles, Policies and Practice: Evaluating the Environmental Sustainability of Britain's Packaging Regulations*, 8 SUST. DEV. 51, 56 (2000).

89. *Plastic Packaging Tax: Detailed HMRC Guidance on Penalties*, ICAEW (Apr. 18, 2023), https://www.icaew.com/insights/tax-news/2023/apr-2023/plastic-packaging-tax-detailed-hmrc-guidance-on-penalties (discussing fixed penalties and daily default penalties for non-compliance with record-keeping obligations under the PPT regime).

90. Finance Act 2021, c. 26, § 61, Sch. 10, pt. 1 at 1–3; pt. 2 at 4–5 (UK).

91. HM Revenue & Customs, *Plastic Packaging Tax Penalties*, GOV.UK (Sept. 21, 2023), https://www.gov.uk/guidance/plastic-packaging-tax-penalties.

92. *Id*.

increases with each subsequent late return, with a maximum penalty of £400 for repeated offences within 12 months.[93] Additional penalties may apply if returns remain outstanding for extended periods.

Paying the PPT late incurs a 5% penalty on the outstanding amount.[94] Further penalties apply if the payment remains overdue after 5 or 11 months.[95] Submitting incorrect information on a PPT return can lead to financial penalties based on the amount of tax underpaid or overclaimed. The severity of the penalty depends on the nature of the inaccuracy, whether it was deliberate, and the level of cooperation with HMRC. Failing to meet other PPT obligations, such as record-keeping or providing information to HMRC, can result in a fixed penalty of £500 and an additional daily penalty of £40 until compliance is achieved.[96]

Businesses that disagree with a penalty decision can request a review or appeal to a tax tribunal.[97] There may be grounds for reducing or cancelling a penalty if the business can demonstrate a reasonable excuse for noncompliance.[98] This graduated penalty structure, escalating in severity for repeated offences, is a common feature of tax administration designed to incentivize timely compliance.[99] Yet, the inclusion of criminal sanctions for the most egregious cases of noncompliance underscores the government's determination to deter tax evasion and protect public revenue.

For the PPT to be effective, it will have to strike a balance between enforcing stringent measures and having accessible compliance support.[100] Penalties can be a strong deterrent, but an effective enforcement mechanism must be paired with comprehensive guidance to ensure clarity and prevent unintentional noncompliance. HMRC requires adequate resources and specialized expertise to effectively identify, investigate, and address noncompliance. Also, accessible support systems are needed to help taxpayers in navigating the rigours of the PPT framework. This approach is critical in optimizing the impact of PPT on reducing plastic waste and generating revenue, in addition to minimizing administrative burdens for compliant organizations.

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93. *Id*.

94. Finance Act 2021, c. 26, § 61, Sch. 10 (UK); *Plastic Packaging Tax Penalties*, *supra* note 92.

95. *Plastic Packaging Tax Penalties*, *supra* note 92.

96. *Id.*

97. *Id.*

98. *Id.*

99. Ken Devos, *Penalties and Sanctions for Taxation Offences in Selected Anglo-Saxon Countries: Implications for Taxpayer Compliance and Tax Policy*, 14 REV. L.J. 32, 43 (2004).

100. Ahmad Raza et al., *Impact of Plastic Packaging on Waste Accumulation and Global Tax Regimes to Mitigate the Plastic Pollution: Multifaceted Crisis and Sustainable*, *in* PLASTIC AND THE COVID-19 PANDEMIC 83, 90 (O.A. Anani et al. eds., 2025).

Spain and Italy have taken additional steps to fight plastic pollution, which suggests a broader European trend toward sustainable conduct.[101] Spain's 2023 Plastic Tax focuses on the production, import, and sale of non-reusable plastic packaging with insufficient recycled content.[102] Businesses are required to pay €0.45 per kilogram of non-recycled plastic, with a minor monthly exemption to accommodate small-scale usage.[103] While this structure contributes to the use of recycled materials, it raises concerns about enforcement consistency and its economic effect on small businesses. In contrast, Italy has delayed its Plastic Tax, which was supposed to go into effect from 2020 to 2027.[104] This delay shows the difficulties of balancing environmental goals with economic and political interests. The fee will apply to single-use plastic products, which shows the country's commitment to waste reduction. However, the extended deadline raises worries over whether such delays weaken the importance of addressing plastic pollution and reduce the drive for systemic change across Europe.[105]

B. Extended Producer Responsibility

The UK has embraced the concept of Extended Producer Responsibility (EPR), a crucial component of its legal framework. The recent amendments to the Packaging Waste (Data Reporting) (England) Regulations 2023 and the announcements on the Extended Producer Responsibility for Packaging Scheme (EPR Packaging Scheme) by the UK government, along with potential changes in the EU under the EU Packaging and Packaging Waste Directive, signify a significant shift in the regulatory landscape for packaging and its environmental impact.[106] The UK packaging regulatory landscape has transitioned from simple data collection to a full EPR framework. While the 2023 Data Reporting Regulations initially required producers to report the type and volume of packaging introduced to the market, these obligations

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101. M.A. Martín-Lara et al., *Environmental Status of Marine Plastic Pollution in Spain*, 170 MARINE POLLUTION BULL., Sept. 2021, at 1, 16.

102. *Plastic Packaging Tax*, PWC, https://www.pwc.co.uk/services/tax/plastic-packaging-tax.html (last visited Apr. 9, 2026).

103. Salvatore Antonello Parente, *Environmental Taxation and the Circular Economy: What Are the Prospects in the European Context?*, 29 BIAŁOSTOCKIE STUDIA PRAWNICZE 91, 99 (2024).

104. Michelle Ann Joseph, *Italy Delays Plastic Tax to 2027*, ARGUS MEDIA (Oct. 16, 2025), https://www.argusmedia.com/en/news-and-insights/latest-market-news/2742946-italy-delays-plastic-tax-to-2027.

105. *Id.*

106. Giulia Barbone et al., *New UK and EU Extended Producer Responsibility for Packaging Requirements*, NORTON ROSE FULBRIGHT (Aug. 2023), https://www.nortonrosefulbright.com/en/knowledge/publications/e60a6d97/new-uk-and-eu-extended-producer-responsibility-for-packaging-requirements.

have since been integrated into a comprehensive liability system.[107] Under the current regime, producers face stricter reporting for reusable packaging and new offences for noncompliance.[108] Notably, although the collection of household waste disposal fees was deferred to 2025 to mitigate economic pressures, as of 2026, producers are now liable for these costs, which are increasingly determined by the recyclability of their materials.[109]

This approach places responsibility on producers to manage the entire life cycle of their products, including the post-consumer phase. The EPR concept encourages producers to take greater responsibility for the environmental impact of their products throughout their lifecycle.[110] This can result in packaging designs that minimize the risk of fragmentation and the release of microplastics during production, use, and disposal. This incentivizes producers to design products and packaging that are less likely to contribute to airborne microplastic pollution during their use and disposal phases.[111] By extending responsibility beyond the point of sale, EPR compels producers to consider the end-of-life phase of their products, including how they might contribute to airborne microplastic pollution. This can lead to innovations in product design, material selection, and waste management practices. The Environment Act 1995, in England, Wales, and Scotland, and the Producer Responsibility (Northern Ireland) Order 1998, establish the legal basis for the EPR scheme for packaging.[112] In addition, other regulations run parallel.[113] The Producer Responsibility Obligations[114] cover the recycling and recovery of packaging waste.[115] They outline the obligations that businesses must fulfil in terms of recovering and recycling a specified proportion of the packaging they place on the market.[116] The UK's

107. Packaging Waste (Data Reporting) (England) Regulations 2023, SI 2023/176, reg. 8 (UK).

108. Packaging Waste (Data Reporting) (England) (Amendment) Regulations 2023, SI 2023/720, reg. 4, 10 (UK) (simplifying reporting for reusable packaging and establishing new offences for non-compliance).

109. *See* PackUK, *Year 1 Extended Producer Responsibility for Packaging Fees Update*, GOV.UK (Feb. 24, 2026), https://www.gov.uk/government/news/year-1-extended-producer-responsibility-for-packaging-fees-update.

110. Candice Stevens, *Extended Producer Responsibility and Innovation*, *in* ECONOMIC ASPECTS OF EXTENDED PRODUCER RESPONSIBILITY 199, 199 (2004).

111. Emily Cowan et al., *Single-Use Plastic Bans: Exploring Stakeholder Perspectives on Best Practices for Reducing Plastic Pollution*, 8 ENV'T, Aug. 16, 2021, at 1, 2–3.

112. SMITH, *supra* note 60, at 25.

113. *Cf.* Producer Responsibility Obligations (Packaging Waste) Regulations (Northern Ireland) 2007, SI 2007/198 (NI 3), which contain substantially similar provisions applicable in Northern Ireland.

114. Producer Responsibility Obligations (Packaging Waste) Regulations 2007, SI 2007/871 (as amended).

115. *Id.* reg. 7, reg. 12, reg. 13 (UK).

116. The Packaging Waste (Data Reporting) (England) Regulations 2023, SI 2023/219, reg. 16, reg. 23 (UK).

2015 Packaging Regulations cover the single market and design and manufacturing aspects of packaging, ensuring that packaging meets essential requirements.[117] Additionally, the EPR cannot be suited to regulate the peculiar characteristics of airborne plastics which have been dismissed as being of *de minimis* impact without reference to its health and social implications.[118]

Obligated packaging producers, defined as entities handling over 50 tonnes of packaging annually or with an annual turnover exceeding £2 million, must register with the appropriate environmental regulator.[119] Key responsibilities now include data reporting, meeting recycling targets, obtaining evidence of recycling through electronic packaging recycling notes, and submitting a Certificate of Compliance annually.[120] To ensure compliance, the UK has also established a regulatory framework with clear obligations and penalties. Producers must register, meet the specified recycling targets, and submit annual reports. Noncompliance will result in financial penalties or, in severe cases, criminal charges.[121]

The effective implementation of producer responsibility principles necessitates a robust regulatory framework and enforcement mechanisms. In the UK, a multi-agency approach oversees the management of waste and the obligations of producers. The Environment Agency, serving England and its counterparts in Wales,[122] Scotland,[123] and Northern Ireland,[124] are the primary regulatory bodies responsible for overseeing producer compliance schemes and waste treatment facilities. These agencies ensure that producers fulfil their obligations to manage the environmental impact of their products throughout their lifecycle. Beyond these general environmental regulators, specialized agencies address specific product categories. The Department for

117. Packaging (Essential Requirements) Regulations 2015, SI 2015/1640, reg. 2, reg. 4, reg. 5 (UK).

118. Rose Heppner, *Crimes of the Past, Present, and Future: Considering the Global Problem of Microplastic Pollution and the Potential for Success within the Public Trust Doctrine*, 40 EMORY INT'L L. REV. 111, 124–128 (2025).

119. *Extended Producer Responsibility: All You Need to Know*, ECOVERITAS, https://www.ecoveritas.com/compliance/uk-extended-producer-responsibility-epr (last visited Apr. 9, 2026).

120. *Packaging Waste: Producer Responsibilities*, GOV.UK (Jan. 1, 2024) updated 1 January 2024), https://www.gov.uk/guidance/packaging-producer-responsibilities (under the heading 'Check if you are an obligated packaging producer', stating that obligated producers must 'submit a certificate of compliance (CoC) by 31 January the following year).

121. *Id.*

122. NATURAL RESOURCES WALES, PERFORMANCE REPORT 2022–23: CHIEF EXECUTIVE'S STATEMENT (2023).

123. SCOTTISH ENV'T PROT. AGENCY (SEPA), 2026 MONITORING PLAN FOR PRODUCER RESPONSIBILITY PACKING AND PACKAGING WASTE REGULATIONS 1 (2025).

124. N. IR. ENV'T AGENCY (NIEA), 2026 COMPLIANCE MONITORING PLAN (2026).

Business and Trade is responsible for regulations related to End-of-Life Vehicles, while the Office for Product Safety and Standards oversees regulations for Waste Electrical and Electronic Equipment, batteries, and related restrictions.[125]

While EPRs have primarily focused on managing post-consumer packaging waste, its potential to mitigate airborne microplastics is increasingly recognized but has yet to be utilized. By placing responsibility for the entire lifecycle of a product on the producer, EPR can incentivize a shift towards more sustainable packaging practices.[126] To effectively tackle airborne microplastics, a more holistic approach is necessary. This would involve not only addressing the management of plastic waste, but also preventing the generation of microplastics at its source.

A critical aspect of addressing airborne microplastics through EPR lies in the design phase. Producers can be encouraged to adopt design principles that minimize the generation of microplastics. This includes the selection of materials less prone to fragmentation, the optimization of packaging size and weight, and the incorporation of features that facilitate recycling or recovery.[127] Moreover, EPR can stimulate innovation in packaging materials and technologies by incentivizing research and development into alternatives to conventional plastics.

The relationship between packaging design and airborne microplastics is complex. While reducing the total volume of plastic waste through effective packaging design can indirectly contribute to a reduction in airborne microplastics, a direct causal link is challenging to establish.[128] Furthermore, the impact of packaging design on microplastic formation during the use and disposal phases requires further investigation.

Implementing and enforcing EPR regulations presents its challenges, particularly in data accuracy and reporting.[129] Since EPR aims to improve waste management and environmental outcomes, its success hinges on the

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125. Dep't for Env't et al., *Producer Responsibility Regulations,* GOV.UK, https://www.gov.uk/government/collections/producer-responsibility-regulations (last updated Dec. 22, 2025).

126. *Reducing Plastic Pollution through Extended Producer Responsibility*, U.N. ENV'T PROGRAMME (June 11, 2025), https://www.unep.org/reducing-plastic-pollution-through-extended-producer-responsibility.

127. *A Call for the Implementation of Extended Producer Responsibility Schemes for Packaging*, ELLEN MACARTHUR FOUND. (Oct. 21, 2022), https://www.ellenmacarthurfoundation.org/extended-producer-responsibility/epr-statement.

128. Van-Giang Le et al., *A Comprehensive Review of Micro- and Nano-Plastics in the Atmosphere: Occurrence, Fate, Toxicity, and Strategies for Risk Reduction*, 904 SCI. TOTAL ENV'T, Dec. 15, 2023, at 1, 3, 11, 12.

129. Dipti Gupta & Satya Dash, *Challenges of Implementing Extended Producer Responsibility for Plastic-Waste Management: Lessons from India*, 19 SOC. RESP. J. 1595, 1596, 1599, 1608 (2023).

accurate collection and analysis of data. Data accuracy is key in determining producer obligations, calculating recycling targets, and assessing the overall effectiveness of the scheme. Inconsistencies or inaccuracies in reported data can undermine the integrity of the EPR system and hinder efforts to address environmental challenges like airborne microplastics.[130] Factors such as complex supply chains, varying data collection methods, and the potential for deliberate misreporting can contribute to data quality issues.[131]

Ensuring compliance with EPR regulations is another major challenge. Monitoring producers' activities, verifying data accuracy, and detecting noncompliance require substantial resources and expertise.[132] Moreover, the evolving nature of the packaging industry and the emergence of new packaging materials can create difficulties in keeping up with regulatory requirements. Stronger enforcement mechanisms are essential to address these challenges. This includes regular audits, inspections, and penalties for noncompliance.[133] Additionally, clear and accessible guidelines for data reporting and record-keeping can help to improve data quality. Collaboration between regulators, industry, and other stakeholders is also crucial for developing effective enforcement strategies.

Compliance schemes play a role in aiding EPR implementation for packaging.[134] These schemes act as intermediaries or third parties between producers and regulators and streamline the process of meeting regulatory obligations. Compliance schemes offer a range of services to producers, including paying registration fees on behalf of organisations, reporting packaging data, and getting packaging waste recycling notes or packaging waste export recycling notes.[135] By pooling resources and expertise, these schemes can achieve economies of scale and provide cost-effective solutions

130. Ludovic F. Dumée, *Circular Materials and Circular Design—Review on Challenges Towards Sustainable Manufacturing and Recycling*, 2 CIRCULAR ECON. & SUSTAINABILITY 9, 13, 16 (2021).

131. *Id.*

132. Barbara Siuta-Tokarska et al., *The Concept of Extended Producer Responsibility in the Field of Packaging Industry and the Energy Sector in the Light of the Circular Economy—The Example of Poland*, 15 ENERGIES, Nov. 30, 2022, at 1, 3–4.

133. *Id.*

134. However, the third party must appear in the Compliance Scheme public register. *National Packaging Waste Database*, ENV'T AGENCY, https://npwd.environment-agency.gov.uk/PublicRegisterSchemes.aspx (last visited Apr. 9, 2026). There are currently 40 registered Compliance Schemes in the UK Public Register of Compliance Schemes under the National Packaging Waste Database. *Id*.

135. Dep't for Env't et al., *Extended Producer Responsibility for Packaging: Who is Affected and What to Do*, GOV.UK, https://www.gov.uk/guidance/extended-producer-responsibility-for-packaging-who-is-affected-and-what-to-do (last updated Feb. 10, 2026).

for producer organisations. Additionally, compliance schemes contribute by promoting best practices and knowledge sharing among producers.[136]

However, the effectiveness of compliance schemes depends on several factors. The design and operation of the scheme, the fees charged to producers, and the transparency of its activities are all critical elements. Furthermore, the relationship between compliance schemes and regulators is essential for ensuring effective oversight and enforcement. To maximize the impact of EPR, compliance schemes should focus on changing producers' behaviour.[137] This includes promoting the use of recycled materials, reducing packaging waste, and improving packaging design beyond just assisting organisations with regulatory requirements.

EPR for packaging can be a powerful tool for addressing environmental challenges, but its efficiency is enhanced when aligned with other relevant policies. For instance, by integrating EPR with broader environmental goals like Sustainable Development Goals, the UK and other countries can create a more coherent regulatory framework. One important connection is between EPR and air quality. Reducing plastic packaging waste through EPR can contribute to improved air quality by reducing emissions associated with poor plastic waste management and pollution.[138] The cascading effect of plastic waste is the introduction of airborne microplastics which affect air quality.

EPR is also linked to climate change mitigation efforts; this is the case since EPR supports circularity which is essential for the growth of the circular economy.[139] The circular economy principles underlying EPR align with the broader goals of a low-carbon economy. EPR policies encourage producers to design products that are easier to recycle, reuse, and repair; thus promoting a circular economy.[140] The challenge at this point is that even though traditional EPR systems often focus on material recycling, a true circular economy requires a broader focus on product design, reuse, and

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136. Some provide useful knowledge bases. *See, e.g.*, *Be Compliant*, ECOSURETY, https://www.ecosurety.com/how-we-can-help/be-compliant (last visited Apr. 9, 2026). For example, the Ecosurety Hub, which assists with essential resources to get to grips with EPR, PPT, DRS and the circular economy. *Id.*

137. Flávio de Miranda Ribeiro & Isak Kruglianskas, *Critical Factors for Environmental Regulation Change Management: Evidences from an Extended Producer Responsibility Case Study*, 246 J. CLEANER PROD., Feb. 10, 2020, at 1, 9.

138. Saroj Kumar Pani & Atul Arun Pathak, *Managing Plastic Packaging Waste in Emerging Economies: The Case of EPR in India*, 288 J. ENV'T MGMT., Mar. 27, 2021, at 1, 2.

139. Kieran Campbell-Johnston et al., *How Circular Is Your Tyre: Experiences with Extended Producer Responsibility from a Circular Economy Perspective*, 270 J. CLEANER PROD., May 11, 2020, at 1, 3.

140. Xin Tong et al., *Extended Producer Responsibility to Reconstruct the Circular Value Chain*, 3 CIRCULAR ECONOMY, Feb. 6, 2024, at 1, 3.

repair.[141] There are also economic impacts of implementing EPR on producers and consumers, requiring careful consideration of cost-benefit trade-offs.[142] Also, for products with global supply chains, international cooperation is necessary to ensure the effective implementation of EPR across borders.

C. Deposit Return Scheme

The UK government also worked on draft regulations for a Deposit Return Scheme (DRS)[143] for in-scope drink containers, anticipated to be published by the end of 2023 and to become operational by Autumn 2027. The introduction of DRS for in-scope drink containers aims to increase recycling rates.[144] By incentivizing the return of containers, it may reduce littering and the breakdown of larger plastic items that could contribute to airborne microplastics.

Furthermore, Section 33 of the Environmental Protection Act 1990, includes provisions related to waste management, such as unauthorized or harmful deposit, treatment, or disposal of waste.[145] The Act further imposes a duty of care on those responsible for producing, importing, carrying, keeping, treating, or disposing of controlled waste.[146] They are obligated to take certain measures. These measures include preventing contraventions of environmental regulations, avoiding the escape of waste from their control, and ensuring that waste transfers occur only to authorized persons or for authorized transport purposes.[147] The Environmental Permitting Regulations (England and Wales) 2016, on the other hand, establish environmental permitting requirements related to waste management.[148] Also, the Waste Management Licensing Regulations 2011 govern waste management in Scotland and include licensing requirements.[149] And the Environment Act 2021 (Part 3) empowers the UK government to establish EPR schemes and

141. *Id.* at 2.

142. WORLD BANK, THE ROLE OF EXTENDED PRODUCER RESPONSIBILITY SCHEMES FOR PACKAGING TOWARDS CIRCULAR ECONOMIES IN APEC 15 (2022).

143. DEP'T FOR ENV'T, FOOD & RURAL AFFS., INTRODUCING A DEPOSIT RETURN SCHEME FOR DRINKS CONTAINERS IN ENGLAND, WALES AND NORTHERN IRELAND 29 (2023).

144. *Id.* at 5.

145. RICHARD G.P. HAWKINS & HEIDI S. SHAW, THE PRACTICAL GUIDE TO WASTE MANAGEMENT LAW 175 (Thomas Telford 2004).

146. Environmental Protection Act 1990, c. 43, § 34(1) (Eng. & Wales).

147. *Id.* § 34(1A)–(2A).

148. The Environmental Permitting (England and Wales) Regulations 2016, SI 2016/1154, reg. 12 (UK).

149. Environment Act 2021, c. 30, § 50, sch. 4 (UK); Environment Act 2021, c. 30, § 54, sch. 8 (U.K).

DRS.[150] It aims to improve recycling system consistency, reform controls on plastic waste exports, and implement charges for single-use plastics.[151] Logically, reducing the amount of plastic waste will, in turn, decrease the potential sources of airborne microplastics. However, there is still the need for specific policies and laws that will target the production, distribution, and usage of plastics that can easily degrade into airborne plastics.[152]

This need stems from the fact that the scope of DRS is limited to specific types of containers such as polyethylene terephthalate bottles and aluminium cans.[153] This restricted focus entails that other sources of airborne plastics such as synthetic textiles and smaller plastic items will not be addressed. Though DRS may reduce the littering of in-scope containers, it does not address the many ways through which a microplastic becomes airborne. On a similar end, the Environmental Protection Act 1990, along with subsequent regulations, like the Environmental Permitting (England & Wales) Regulations 2016 and the Waste Management Licensing (Scotland) Regulations 2011, did not address the problems that are associated with airborne microplastic in its provision. These measures did not cover the dynamic nature of airborne microplastic, which can emanate from different sources like domestic activities, industrial emissions, or tyre wear. On another end, the Environmental Act of 2021 did not provide provisions that would help mitigate the emission of microplastics into the air. It did not provide for any monitoring mechanism that would help in reducing the concentration of airborne microplastics. This shows its limitations and gaps regarding airborne microplastics.

The correlation between litter prevention and the reduction of airborne microplastics is a complex issue requiring careful consideration. While a direct causal link is challenging to establish definitively, it is reasonable to hypothesize that reducing litter can contribute to a decrease in airborne microplastics. Litter, particularly plastic waste, is a significant source of microplastics in the environment.[154] Wind, rain, and other environmental factors can break down plastic litter into smaller particles, which can later

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150. Olivia Jamison et al., *Plastics and Packaging Laws in the United Kingdom*, CMS LEGAL, https://cms.law/en/int/expert-guides/plastics-and-packaging-laws/united-kingdom (last updated Mar. 5, 2024).

151. Environment Act 2021, c. 30, §§ 57, 62 (UK).

152. Spyridoula Gerassimidou et al., *Unpacking the Complexity of the UK Plastic Packaging Value Chain: A Stakeholder Perspective*, 30 SUSTAINABLE PROD. & CONSUMPTION 657, 668 (2022).

153. *Deposit Return Scheme*, CITIZENS INFO., https://www.citizensinformation.ie/en/environment/waste-and-recycling/deposit-return-scheme/ (last updated Jan. 24, 2025).

154. Nematollah Jaafarzadeh et al., *Study of the Litter in the Urban Environment as Primary and Secondary Microplastics Sources*, 14 SCI. REPS., Dec. 30, 2024, at 1, 3.

become airborne.[155] Preventing litter reduces the potential for these microplastics to enter the atmosphere.[156] Moreover, litter can act as a transport mechanism for microplastics, carrying them to new locations where they eventually become airborne.[157] Reducing litter can potentially contribute to a decrease in the total concentration of airborne microplastics.[158] It is therefore essential to acknowledge that this relationship is influenced by various factors, including the type of plastic, the size of litter items, and local environmental conditions. Less litter means fewer plastic items entering ecosystems, potentially harming wildlife and contaminating water sources.[159] A DRS is anticipated to significantly reduce littering of in-scope containers, such as small plastic bottles and non-alcoholic cans. The UK DRS provides a financial incentive to consumers to return containers, encouraging proper disposal, and reducing littering.[160] Addressing litter can contribute to the UK government's Levelling Up agenda, which aims to reduce regional inequalities.[161]

The cleaning and processing of returned containers can also introduce microplastics into the environment if not managed carefully. Abrasion from cleaning equipment, the use of cleaning chemicals, and the breakdown of plastic during recycling processes all contribute to microplastic formation.[162] To mitigate these risks, stringent guidelines and regulations must be in place for the operation of DRS facilities. Further, the transportation of collected containers to recycling centres presents another potential source of microplastics.[163] Tyre wear, brake dust, and road debris contribute to microplastic pollution, even during the collection process.[164] Research shows that tyre wear particles are an important source of microplastics and indicates that large amounts of them are transported from the road surface into the

155. Frederic Gallo et al., *Marine Litter Plastics and Microplastics and Their Toxic Chemicals Components: The Need for Urgent Preventive Measures*, 30 ENV'T SCI. EUR., Apr. 18, 2018, at 1, 1–3.

156. *Id.*

157. Yanfang Li et al., *A Review of Possible Pathways of Marine Microplastics Transport in the Ocean*, 3 ANTHROPOCENE COASTS 6, 7–8 (Jan. 24, 2020).

158. *Id*.

159. Rakesh Kumar et al., *Impacts of Plastic Pollution on Ecosystem Services, Sustainable Development Goals, and Need to Focus on Circular Economy and Policy Interventions*, 13 SUSTAINABILITY, Sept. 6, 2021, at 1, 2.

160. Environment Act 2021, c. 30, SS 54, sch. 8 (UK).

161. Mark Fransham et al., *Level Best? The Levelling Up Agenda and UK Regional Inequality*, 57 REG'L STUD. 2339, 2339–40 (2023) (defining the UK's 'levelling up' agenda as a policy programme focused on reducing regional inequalities).

162. Yet Yin Hee et al., *The Effect of Storage Conditions and Washing on Microplastic Release from Food and Drink Containers*, 32 FOOD PACKAGING & SHELF LIFE, June 2022, at 1, 4.

163. Marie Enfrin et al., *Paving Roads with Recycled Plastics: Microplastic Pollution or Eco-Friendly Solution?*, 437 J. HAZARDOUS MATERIALS 129, 334 (2022).

164. *Id.*

stormwater and air.[165] A combination of vehicle emission standards, tyre regulations, road infrastructure improvements, and the transition to electric vehicles can contribute to a more sustainable and environmentally friendly transportation sector.[166]

Synergies between DRS and other policies can amplify their impact. For example, stricter regulations on plastic production and usage can complement DRS by reducing the amount of plastic entering the waste stream.[167] Additionally, investments in waste management infrastructure and research into microplastic capture technologies can enhance the effectiveness of DRS in mitigating airborne microplastics. However, potential conflicts may also arise. For instance, if DRS leads to increased transportation of plastic materials, it could inadvertently contribute to air pollution and greenhouse gas emissions. Such negative consequences could be avoided with careful planning.

Now, effective enforcement and monitoring are important if DRS is going to be successful in reducing airborne microplastics.[168] This is possible with robust compliance mechanisms to ensure that producers, retailers, and consumers fulfil their obligations under the scheme. Regular inspections of DRS facilities, including collection points and recycling centres, will help to identify potential sources of microplastic pollution and ensure adherence to environmental regulations. Additionally, monitoring the quality of recycled materials can prevent the introduction of microplastics back into the supply chain. In this regard, data collection and analysis are essential for tracking the environmental impact of DRS so that the scheme's effectiveness can be monitored to identify areas for improvement. There's also another factor at play: public awareness. Education campaigns and encouragement can influence consumer sentiment towards DRS participation. Such awareness can be effective since the plastic problem is a serious health issue and proper disposal acts as a solution.

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165. Hee et al., *supra* note 162, at 2.

166. *See* INGVILD SKUMLIEN FURUSETH & ELISABETH STØHLE RØDLAND, REDUCING THE RELEASE OF MICROPLASTIC FROM TIRE WEAR: NORDIC EFFORTS 10 (2020); Ilka Gehrke et al., *Review: Mitigation Measures to Reduce Tire and Road Wear Particles*, 904 SCI. TOTAL ENV'T, Aug. 2023, at 1, 19–20.

167. Caterina Picuno et al., *The Potential of Deposit Refund Systems in Closing the Plastic Beverage Bottle Loop: A Review*, 212 RES., CONSERVATION & RECYCLING, Jan. 2025, at 1, 9.

168. Graham Butler, *Deposit Return Schemes of EU Member States and the EU's Internal Market*, 34 REV. EUR. COMPAR. & INT'L ENV'T L. 101, 103 (2025).

D. Single-Use Plastics Directive

The Single-Use Plastics Directive (SUPD) has limited applicability in the UK. The UK, having left the EU, is generally not obligated to transplant EU directives, including the SUPD, into domestic law.[169] Under the Northern Ireland Protocol—which governs the relationship between Great Britain and Northern Ireland to address issues related to the Irish border—certain provisions of EU law, including those from the SUPD, continue to apply to Northern Ireland.[170] Specific provisions of the SUPD had to be transposed into Northern Ireland law by January 1, 2022.[171] The transposition in Northern Ireland included measures to reduce the consumption of plastic cups and food containers.[172] There was a requirement to restrict the placing on the market (i.e., bans) of certain single-use plastic products.

On 1 June 2022, Scotland implemented a ban on several single-use plastic products, including plastic cutlery, plates, straws, beverage stirrers, and balloon sticks.[173] The Scottish Government estimated that approximately 700 million of these items were used annually in Scotland[174]

This legislation, introduced during COP26, includes exemptions for single-use plastic straws to ensure that individuals with medical or independent living needs have access to these items.[175] Before the enforcement of the ban, a six-month grace period was provided, alongside a business awareness campaign that was led by Zero Waste Scotland.[176] However, the Scottish government encountered challenges under the UK Internal Market Act that threatened the effectiveness of the ban.[177] Despite securing an exclusion from the Act, it came into force one month after June 1,

169. Jamison et al., *supra* note 150.

170. *Windsor Framework Explained*, EUR. COUNCIL, https://www.consilium.europa.eu/en/policies/windsor-framework-explained/ (last updated May 28, 2025).

171. Jamison et al., *supra* note 150.

172. *Id.*

173. *Single Use Plastics Ban*, SCOTTISH GOV'T (June 1, 2022), https://www.gov.scot/news/single-use-plastics-ban/ (stating that the ban covers "plastic cutlery, plates and stirrers" and that "[a]round 700 million of these single-use items are currently used in Scotland every year").

174. Scottish Government, Environmental Protection (Single-use Plastic Products) (Scotland) Regulations 2021: Guidance (2022) Section B, ¶ 3.

175. *Id.*

176. *Single-Use Plastic Products (Scotland) Regulations 2021*, ZERO WASTE SCOT. (Mar. 21, 2023), https://www.zerowastescotland.org.uk/resources/single-use-plastic-products-scotland-regulations-2021.

177. Damon Davies, *Scotland's Ban on Single-Use Plastics: A Case Study of the Impact of the UK Internal Market Act*, SPICE SPOTLIGHT (Oct. 27, 2022), https://spice-spotlight.scot/2022/10/27/scotlands-ban-on-single-use-plastics-a-case-study-of-the-impact-of-the-uk-internal-market-act/.

2022.[178] The objective is to encourage businesses to adopt reusable alternatives, reduce litter, and curb emissions, with enforcement entrusted to local authorities and a maximum fine of £5,000 for noncompliance.[179]

Minimum charges for single-use carrier bags have been in effect across the UK for several years, but the specific charges have varied by region. On October 1, 2011, Wales became the first UK country to introduce a charge for single-use carrier bags. The introduction of the 5 pence charge has had a real impact on their use in Wales.[180] In Scotland, the Scottish Parliament passed legislation on October 20, 2014 (amended April 1, 2021) that requires all retailers (food and non-food) to "charge a minimum of 10p for each new single-use carrier bag (including paper, those made from some plant-based materials and plastic)."[181] Starting from October 2015, businesses in the UK implemented a charge of 5 pence (equivalent to $0.15–0.20 USD) for each single-use plastic carrier bag.[182] To circumvent this fee, consumers have the option of using reusable bags for their purchases. The regulation applies to all enterprises with over 250 employees. As of May 21, 2021, the minimum charge for single-use plastic bags in England increased to ten pence.[183] These charges are part of efforts to reduce the use of single-use plastic bags and encourage the adoption of more sustainable alternatives.

In England, the ban on single-use products such as drinking straws, plastic-stemmed cotton buds, and plastic drink stirrers was implemented in stages. In October 2023, the ban was extended to include single-use plastic plates, trays, bowls, cutlery, balloon sticks, and expanded and extruded polystyrene foods and drink containers.[184] In Scotland, similar bans are in place.[185] While the Scottish government has considered banning oxo-degradable plastic products, a definitive ban on these items has not been

178. *Single-Use Plastic Products (Scotland) Regulations 2021*, supra note 176.

179. *Id.*

180. *Public Willingness to Pay for Carrier Bags in Wales (Summary)*, WELSH GOV'T (Nov. 4, 2021) https://www.gov.wales/public-willingness-pay-carrier-bags-wales-summary-html (The levy was first introduced in 2013 to help improve the environment by encouraging the reuse of carrier bags, and by preventing the unnecessary buying of bags).

181. *Single-Use Carrier Bags Charge (Scotland)*, ZERO WASTE SCOT. (Mar. 21, 2023), https://www.zerowastescotland.org.uk/resources/single-use-carrier-bags-charge-scotland.

182. Ndubuisi Nwafor & Tony R. Walker, *Plastic Bags Prohibition Bill: A Developing Story of Crass Legalism Aiming to Reduce Plastic Marine Pollution in Nigeria*, 120 MARINE POL'Y, Aug. 2, 2020, at 1, 6.

183. *Carrier Bag Charges: Retailers' Responsibilities*, DEP'T FOR ENV'T, FOOD & RURAL AFFS. (July 28, 2025), https://www.gov.uk/guidance/carrier-bag-charges-retailers-responsibilities.

184. *Single-Use Plastics Bans and Restrictions*, DEP'T FOR ENV'T, FOOD & RURAL AFFS. (Oct. 7, 2024), https://www.gov.uk/guidance/single-use-plastics-bans-and-restrictions.

185. SCOTTISH GOV'T, ENVIRONMENTAL PROTECTION (SINGLE-USE PLASTIC PRODUCTS) (SCOTLAND) REGULATIONS 2021 (2022).

confirmed.[186] Meanwhile, the Welsh government is introducing legislation to restrict the sale and supply of certain single-use plastics, including items banned in England and Scotland.[187]

Under the Environmental Act 2021, the UK introduced charges for any single-use plastic item, providing the potential for new charges in the future. The Act includes provisions enabling the government to modify rules within producer responsibility schemes.[188] It stipulates that individuals engaged in the manufacture, processing, distribution, or supply of products or materials may be obligated, through regulations, to financially support or contribute to the expenses associated with the disposal of such items. The objective is to create a compelling motivation for producers of packaging to carefully assess the consequences of their products after consumers discard them.[189] However, the commendable inroads made in single-use plastic regulations and policies cannot be effective in the governance of airborne plastic. Single-use plastics are less problematic, easily identifiable, and tailor-made for positive legislation. By contrast, airborne plastic is difficult to classify and elusive to remediate.[190] Single-use plastic legislation will be ineffective in tackling the myriad of sources and transboundary characteristics of airborne plastic.

III. LEGAL FRAMEWORK IN THE EUROPEAN UNION

Following Brexit, the United Kingdom (UK) is no longer part of the European Union (EU);[191] However, it is worth exploring the comparative legal frameworks for plastics governance to evaluate the position of airborne plastics governance in the region. Within the EU, a comprehensive legal framework has been established to address plastic pollution and enhance waste management practices. EU directives and regulations cover various aspects, including the reduction of single-use plastics, recycling targets, and

186. *See* SANDHYA DEVALLA, THE JAMES HUTTON INST., REVIEW OF EVIDENCE ON OXO-BIODEGRADABLE PLASTIC PRODUCTS 2 (2022) (discussing the EU ban on ox-degradable plastics and their impact on the environment).

187. The Environmental Protection (Single-use Plastic Products) Act 2023 (Wales).

188. Environment Act 2021, c. 30, § 50, sch. 4 (UK).

189. Memorandum from the Dep't for the Env't, Food and Rural Affairs to the Delegated Powers and Regul. Reform Comm. (Jan. 30, 2020), ¶ 57.

190. Hannah Tiernan et al., *Implementation of a Structured Decision-Making Framework to Evaluate and Advance Understanding of Airborne Microplastics*, 135 ENV'T SCI. & POL'Y 169, 170–72 (2022) (noting that airborne microplastics present significant knowledge gaps and obstacles to effective action and remediation).

191. Matthias Matthijs, *Europe After Brexit: A Less Perfect Union*, 96 FOREIGN AFF. 85, 85 (2017).

measures to promote a circular economy. Several extant EU policies and directives are discussed below.

First, the Packaging and Packaging Waste Directive[192] sets out measures to prevent or reduce the impact of packaging on the environment.[193] It includes targets for the recovery and recycling of packaging waste, as well as provisions for the use of environmentally friendly packaging materials. The EU Directive aligns with the goals of the UK Packaging Regulations, by holding businesses accountable for packaging reduction, recycling, and recovery. Member States are mandated to establish Extended Producer Responsibility (EPR) schemes for all packaging by the end of 2024.[194] The European Commission's proposal in November 2022 seeks to review and repeal the EU Directive, focusing on waste prevention, recyclability goals by 2030, and increased use of recycled plastics in packaging.[195] The proposal also mandates Member States to introduce Deposit Return Schemes (DRS) for single-use plastics and metal beverage containers by January 1, 2029.[196] This Directive cannot be used to tackle the menace of airborne plastics, which will need specific laws to confront the novel issues emanating from airborne plastics in the atmosphere.

Second, the Single-Use Plastics Directive aims to reduce the impact of certain plastic products on the environment,[197] particularly in the marine environment, by restricting the production and consumption of single-use plastics.[198] It includes measures such as bans on certain single-use plastic products and the promotion of EPR schemes. The EU's Circular Economy Action Plan likewise promotes a transition to a circular economy through sustainable use and recycling of materials, including plastics.[199] It sets targets for recycling and emphasizes the importance of reducing plastic waste. The

192. Council Directive 94/62/EC.

193. Council Directive 94/62/EC, 1994 O.J. (L 365) 10; Guillaume Ragonnaud, *Revision of the Packaging and Packaging Waste Directive*, EUR. PARL. RSCH. SERV., PE 745.707 at 2 (Apr. 2024).

194. Shari Lorang et al., *Achievements and Policy Trends of Extended Producer Responsibility for Plastic Packaging Waste in Europe*, 4 WASTE DISPOSAL & SUSTAINABLE ENERGY 91, 98 (2022).

195. Hazel O'Keeffe, *EU Proposal for a Regulation on Packaging and Packaging Waste - the Highlights*, LEXOLOGY (Oct. 10, 2023), https://www.lexology.com/library/detail.aspx?g=04c4ae2f-c5b8-4ab8-8cf4-cf1086b4e89a.

196. *Id.*

197. Directive 2019/904, of the European Parliament and of the Council of 5 June 2019 on the Reduction of the Impact of Certain Plastic Products on the Environment, 2019 O.J. (L 155) 1.

198. *Single-Use Plastics*, EUR. COMM'N, https://environment.ec.europa.eu/topics/plastics/single-use-plastics_en (last visited Apr. 2, 2026).

199. *See Circular Economy*, EUR. COMM'N, https://environment.ec.europa.eu/strategy/circular-economy_en (last visited Apr. 2, 2026); *The EU's Circular Economy Action Plan*, ELLEN MACARTHUR FOUND. (Jan. 12, 2022), https://www.ellenmacarthurfoundation.org/circular-examples/the-eus-circular-economy-action-plan.

focus of this Directive is not on airborne plastics, and any such interpretation may result in stretching the regulation to absurdity.

Third, the Waste Framework Directive is a general directive without a specific category of waste target that establishes a legal framework for waste management in the EU.[200] It includes provisions on waste prevention, recycling, and the proper disposal of waste. Member States are required to develop waste management plans to achieve specific targets. Article 10(2) of the Waste Framework Directive sets out a general requirement for separate collection and obliges Member States to set up separate collection systems for at least paper, metal, plastic, and glass by 2015.[201] In addition, Article 11(1) sets out requirements for Member States to take measures to promote high-quality recycling through separate collection.[202] While this Directive can generally serve as a foundation for further regulatory action regarding control of sources of airborne plastics, microplastics, and nanoplastics—which are the main sources of airborne plastics—may not be subject to separate collection control.

Fourth, the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation is another interesting legal instrument in the EU. While not specific to plastics, the regulation addresses the foundational materials for plastic.[203] It plays a role in regulating the use of certain chemicals in plastic products to protect human health and the environment. This Regulation assigns the industry responsibility for risk management of chemicals and the provision of safety information on substances. Manufacturers and importers must collect data on the properties of their chemical substances and register this information in a central database at the European Chemicals Agency.[204] This regulation has no direct connection with airborne plastics but may be useful in tracking the chemicals that are used in the production of synthetic fibres—which are a major source of airborne pollution. Synthetics originated exclusively from synthetic

200. Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on Waste and Repealing Certain Directives, 2008 O.J. (L 312) 3; *Waste Framework Directive*, EUR. COMM'N, https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framework-directive_en (last visited Apr. 2, 2026).

201. Nicole Seyring et al., *Assessment of Collection Schemes for Packaging and Other Recyclable Waste in European Union-28 Member States and Capital Cities,* 34 WASTE MGMT. & RSCH. 947, 947–56 (2016).

202. Council Directive 2008/98/EC, art. 11, 2008 O.J. (L 312) 3.

203. Regulation (EC) No 1907/2006; *REACH Regulation*, EUR. COMM'N, https://environment.ec.europa.eu/topics/chemicals/reach-regulation_en (last visited Apr. 2, 2026).

204. *REACH—Regulation for Registration, Evaluation, Authorisation and Restriction of Chemicals*, EUR. AGENCY FOR SAFETY & HEALTH AT WORK, https://osha.europa.eu/en/themes/dangerous-substances/reach (last visited Apr. 2, 2026).

resources like fossil fuels or petroleum products.[205] Synthetic fibres include nylon (polyamide), polyester, spandex, olefin, acrylic, and these types of materials are wrinkleless, stain-free, and pest-resistant.[206] They can be broken down to form microplastics.

In conclusion, the EU, just like the UK, is still struggling with how to respond to the emerging challenges of airborne plastic. Up-to-date legislation should be enacted to serve as a model legal instrument which will specifically regulate the intricate nuances and peculiar characteristics of airborne plastic.

IV. GLOBAL LEGAL INSTRUMENTS

The global legal landscape governing plastic pollution is shaped by international agreements and conventions. This Part examines key global legal instruments that address the transboundary nature of plastic pollution. Notably, no international treaty or agreement specifically targets airborne microplastics. Global environmental agreements, such as the Stockholm Convention on Persistent Organic Pollutants or the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, touch upon aspects of plastic pollution, but they do not specifically address airborne microplastics.

First, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal[207] has the objective of regulating the transboundary movement of hazardous waste, including plastic waste, to prevent and minimize its generation and ensure environmentally sound management.[208] In 2019, the Conference of the Parties to the Basel Convention adopted two important decisions in a bid to tackle plastic waste. These steps have strengthened the Basel Convention as "the only global legally binding instrument to specifically address plastic

205. John C. Ruth & Gregory Stephanopoulos, *Synthetic Fuels: What Are They and Where Do They Come From?*, 81 CURRENT OP. BIOTECH., June 2023, at 2.

206. Jamal Akhter Siddique & Ayaz Mohd, *Coir Fiber-Based Nanocomposites: Synthesis and Application*, *in* COIR FIBER AND ITS COMPOSITES: PROCESSING, PROPERTIES AND APPLICATIONS 273, 274 (Mohammad Jawaid ed., 2022).

207. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal annex II, VIII, IX, U.N. Doc. UNEP/BRS/2014/3 (2014) (Basel Convention 1992 (as amended), Annex II, VIII, IX categorised plastic wastes based on their hazard levels and ability to be recycled. Basel Convention 1992 (as amended), Annex II also required prior informed consent for the export of mixed or contaminated plastic waste, which helps ensure such waste is managed in an environmentally sound manner.).

208. Katharina Kummer Peiry, *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal*, U.N. AUDIOVISUAL LIBR. OF INT'L L. 1, 4 (2010), https://legal.un.org/avl/pdf/ha/bcctmhwd/bcctmhwd_e.pdf.

waste."[209] Similarly, the Plastic Waste Amendments to the Basel Convention (effective January 1, 2021) aim to regulate the transboundary movement of certain categories of plastic waste to reduce the environmental impact of plastic pollution.[210] The amendments expand the scope of the Basel Convention to include specific plastic waste categories and enhance controls on their transboundary movements.[211] The amendments address specific categories of plastic waste, ensuring tighter controls and environmentally sound management, which can directly impact the generation of airborne microplastics.[212] The Basel Convention addresses the global trade in plastic waste and aims to minimize its impact on the environment and human health. However, the future of airborne plastics and its global implications cannot be subjected to a one-stop shop-like convention that cannot prevent sources of airborne plastics or troubleshoot its many complexities.

Second, the Stockholm Convention on Persistent Organic Pollutants (POPs) aims to control and eliminate the production, use, and release of POPs, including certain plastic additives and byproducts.[213] The Stockholm Convention contributes to reducing the environmental impact of specific plastic-related chemicals that can persist and bioaccumulate. POPs contribute to the environmental persistence and bioaccumulation of plastic-related chemicals.[214] The Convention's provisions may contribute to mitigating the impact of airborne microplastics by regulating specific chemicals associated with plastics. Nevertheless, the Convention is not designed to regulate

209. *Plastic Waste: Overview*, BASEL CONVENTION ON THE CONTROL OF TRANSBOUNDARY MOVEMENTS OF HAZARDOUS WASTES & THEIR DISPOSAL, https://www.basel.int/Implementation/Plasticwaste/Overview/tabid/8347/Default.aspx (last visited Apr. 7, 2026).

210. *Basel Convention Plastic Waste Amendments*, BASEL CONVENTION ON THE CONTROL OF TRANSBOUNDARY MOVEMENTS OF HAZARDOUS WASTES & THEIR DISPOSAL, https://www.basel.int/Implementation/Plasticwaste/Amendments/Overview/tabid/8426/Default.aspx (last visited Apr. 7, 2026); Emily Benson & Sarah Mortensen, *The Basel Convention: From Hazardous Waste to Plastic Pollution*, CTR. FOR STRATEGIC & INT'L STUD. (Oct. 7, 2021), https://www.csis.org/analysis/basel-convention-hazardous-waste-plastic-pollution.

211. Eva Romee van der Marel, *Trading Plastic Waste in a Global Economy: Soundly Regulated by the Basel Convention?*, 34 J. ENV'T L. 477, 481–482 (2022).

212. Priscilla Boccia et al., *Potential Effects of Environmental and Occupational Exposure to Microplastics: An Overview of Air Contamination*, 12 TOXICS, Apr. 2024, at 1, 2.

213. Stockholm Convention on Persistent Organic Pollutants (POPs) art. 9, U.N. Doc. UNEP/BRS/2025/7 (2025) (Article 3 aims to restrict the production and use, as well as the import and export, of the intentionally produced POPs that are listed in Annex B to the Convention. Article 5 aims to reduce or eliminate releases from unintentionally produced POPs that are listed in Annex C to the Convention. Article 6 aims to ensure that stockpiles and wastes consisting of, containing, or contaminated with POPs are managed safely and in an environmentally sound manner.)

214. Hongrui Zhao et al., *Organic Pollutants Associated with Plastic Debris in Marine Environment: A Systematic Review of Analytical Methods, Occurrence, and Characteristics*, INT'L J. ENV'T RES. PUB. HEALTH, Mar. 2023, at 1, 12–13.

airborne plastics and will be ineffective in tackling its health and environmental impacts.

Third, the United Nations Environment Programme (UNEP) Resolutions on Marine Litter and Microplastics aims to address marine litter, including plastics, through international cooperation and the development of strategies to prevent and reduce marine plastic pollution.[215] UNEP resolutions contribute to global efforts to combat marine plastic pollution, emphasizing prevention, cleanup, and sustainable management.[216] Strategies for preventing and reducing marine litter, as promoted by UNEP, inherently address sources that can contribute to airborne microplastics, especially in coastal and terrestrial environments.[217] Unfortunately, the main emphasis of this resolution is marine plastics and not airborne plastics. It can be of ancillary benefit, but it cannot be relied upon to govern airborne plastics.

Additionally, the Plastics Pollution Prevention Alliance (PPPA) aims to promote international cooperation and partnerships to address plastic pollution, focusing on prevention, cleanup, and sustainable management.[218] The PPPA is a voluntary initiative that seeks to mobilize action across sectors and stakeholders to address the global challenge of plastic pollution.[219] Prevention and sustainable management practices advocated by PPPA contribute to reducing the presence of plastics in the environment, thereby mitigating potential sources of airborne microplastics. Presently, the UNEA Resolution 5/14[220] mandated the Executive Director of the UNEP to convene an Intergovernmental Negotiating Committee (INC) dedicated to formulating an international legally binding instrument on plastic pollution, with a focus on the marine environment.[221]

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215. United Nations Environment Assembly, *Marine Plastic Litter and Microplastics*, U.N. DOC. UNEP/EA.2/Res.11 (Aug. 4, 2016).

216. Peter Stoett et al., *Global Plastic Pollution, Sustainable Development, and Plastic Justice*, 184 WORLD DEV., Aug. 2024, at 1, 2.

217. Jahanggir Alam & Mostafizur Rahman, *Various Conventional and Advanced Management Techniques and Policies Adopted at the Global Level for Microplastics*, *in* MICROPLASTICS 429, 435 (2025); Luis M. García-Marín & Miguel E. Rentería, *Fighting Plastic Pollution with a Circular Economy Roadmap and Strategy: Addressed to the United Nations Environment Programme*, J. SCI. POL'Y & GOVERNANCE, Apr. 2024, at 1, 2–3.

218. *UNDP and Rare Announce Partnership to Address Plastic Pollution*, U.N. DEV. PROGRAMME (May 10, 2023), https://www.undp.org/news/undp-and-rare-announce-partnership-address-plastic-pollution.

219. Sarah Maria Denta, *Public-Private Partnership for the Climate: From a Plastic Pollution Perspective*, 16 EUR. PROCUREMENT & PUB. PRIV. P'SHIP L. REV. 318 (2021).

220. United Nations Environment Assembly, *End Plastic Pollution: Towards an International Legally Binding Instrument*, U.N. Doc. UNEP/EA.5/Res.14, at 3 (Mar. 2, 2022).

221. *Intergovernmental Negotiating Committee on Plastic Pollution*, U.N. ENV'T PROGRAMME, https://www.unep.org/inc-plastic-pollution (last updated Mar. 17, 2026).

The INC is responsible for bringing together representatives from various countries to negotiate and draft the terms of the treaty. The negotiations focus on developing a comprehensive approach that covers the entire life cycle of plastic, including its production, design, use, and disposal.[222] The goal is to establish effective measures to reduce plastic pollution globally. As of April 2024, INC had its fourth session (INC-4), which took place in Ottawa, Canada, with a focus on refining the treaty's text.[223] The fifth session (INC-5) occurred in Busan, South Korea, in November 2024, when delegates were unable to reach a final agreement on the treaty. Key points covered in the session included the scope of the treaty, the balance between binding and voluntary measures, and the mechanisms for implementation and enforcement.[224] The reason for the delay in this treaty's implementation can be linked to the diverse national interests of the delegates of various countries. They hold different opinions on issues like production caps, waste management responsibilities, and financial commitment.[225] However, issues of airborne plastics have not been given priority in the ongoing negotiations, and this has deprived the UK of keying into any international legal instrument as a model law for its regulatory framework for airborne plastics.[226]

The draft treaty proposed setting reduction targets for the production and supply of primary plastic polymers.[227] This provision did not include any language addressing plastics that degrade into airborne particles during disposal, use, or incineration.[228] The draft treaty also provided for the elimination of emissions and releases from plastic polymers and products

222. News Wires, *Nations Agree to Draft Landmark UN Treaty Against Plastic Pollution by End of 2023*, FR. 24 (Mar. 6, 2023), https://www.france24.com/en/environment/20230603-un-agrees-to-draft-landmark-treaty-against-plastic-pollution-by-end-of-2023.

223. Press Release, U.N. Env't Programme, Pivotal Fourth Session of Negotiations on a Global Plastics Treaty Opens in Ottawa (Apr. 24, 2024), https://www.unep.org/news-and-stories/press-release/pivotal-fourth-session-negotiations-global-plastics-treaty-opens.

224. International Institute for Sustainable Development, *Summary of the First Session of the Fifth Session of the Intergovernmental Negotiating Committee to Develop an International Legally Binding Instrument on Plastic Pollution: 25 November – 2 December 2024*, 36 EARTH NEGOTS. BULL., Dec. 3, 2024, at 1, 1.

225. Joyce Lee & Valerie Volcovici, *Countries Fail to Reach Agreement in UN Plastic Talks*, REUTERS (Dec. 2, 2024), https://www.reuters.com/business/environment/over-100-countries-back-plastic-treaty-caps-talks-reach-fierce-finish-2024-11-30/.

226. Global Plastics Policy Centre, Researchers Warn the UK is Falling Behind International Efforts as Microplastics Infiltrate Food, Bodies and Ecosystems, Univ. of Portsmouth (May 6, 2025) https://www.port.ac.uk/news-events-and-blogs/news/researchers-warn-the-uk-is-falling-behind-international-efforts-as-microplastics-infiltrate-food-bodies-and-ecosystems.

227. United Nations Environment Programme, *Zero Draft Text of the International Legally Binding Instrument on Plastic Pollution, Including in the Marine Environment*, U.N. Doc. UNEP/PP/INC.3/4, at 7 (Sept. 4, 2023).

228. *Id.*

across their life cycle, but it did not address airborne plastics as a distinct category.[229] It failed to give explicit guidelines for reducing microplastics that are released into the atmosphere during activities like road traffic, industrial processes, or open burning. In addition, the section talked about tackling the issues surrounding trades in chemicals, polymers, and plastic products, which includes controls on exports to ensure environmental soundness and compliance.[230] Regrettably, the provision does not cover products that contribute to airborne microplastics such as certain consumer goods and industrial emissions. Also, the focus of the treaty is solely on land and water pollution. No strategies were carved for preventing microplastics from entering the air during the handling of waste, which may come in the way of improper disposal or incineration.

After the stalled talks during the INC-5 meeting in November 2024, a Revised Text Proposal (Revised Text) was introduced on August 15, 2025, by the INC Chair to help build consensus among States.[231] The new draft is a definite movement towards a comprehensive lifecycle approach. From the beginning, it sets out a clear objective of the agreement as being one of protecting the environment, as well as human health affected by plastic pollution with a full lifecycle approach.[232] This comprises periods from production, use, and discard through to its degradation into microplastics and release into the air.[233]

Following the revision, various parts of the Revised Text have become potentially relevant to airborne microplastics. With regard to plastic product design, the Revised Text sets out a requirement of improving design with a view to preventing leakages and emissions of microplastics.[234] Article 6—on releases and leakages—requires countries to make efforts to detect, prevent, reduce, and, if possible, eradicate release of plastics, including microplastics into the environment.[235] Although general, there is no provision on direct release detection and regulation of airborne microplastics. Article 7 specifically addresses open burning, dumping, and environmentally sound disposal of plastic wastes that are identified as sources of releases of

229. *Id.* at 14.

230. *Id.* at 16–17.

231. Intergovernmental Negotiating Comm. to Dev. an Int'l Legally Binding Instrument on Plastic Pollution, Including in the Marine Env't, *Chair's Revised Text Proposal* (Luis Vayas Valdivieso, Chair) art. 1 (Aug. 15, 2025) [hereinafter *Revised Text*].

232. *Id.*; *cf.* Nils Simon et al., *A Binding Global Agreement to Address the Life Cycle of Plastics*, 373 SCIENCE 43, 44 (2021).

233. Karen Raubenheimer et al., *Towards an Improved International Framework to Govern the Life Cycle of Plastics*, 27 REV. EUR., COMPAR. & INT'L ENV'T L. 210, 219 (2018).

234. *Revised Text*, *supra* note 231, at art. 5(1)(a)(ii).

235. *Id.* at art 6.

microplastics to the atmosphere, but not presented as an atmosphere pollution issue.[236]

The current Revised Text fails to specifically address airborne microplastics as a distinct priority. The lack of direct references to the atmospheric routes leaves major emissions sources, like road traffic abrasion, industrial, waste incineration, and burning, poorly defined.[237] Even the articles related to reducing production and phasing out of plastic products ignore the type of plastic that breaks down into airborne emissions throughout normal or end-of-life stages.[238]

Although the draft agreement has monitoring obligation provisions, it does not include an obligation to monitor air specifically for microplastics.[239] This might continue deregulation, especially until more evidence becomes available about the inhalational hazards of airborne microplastics. Additionally, while the Revised Text purports to impose binding obligations on member nations, it merely provides for reporting obligations without setting out sanctions for breach, the disciplinary body, and procedure for disciplinary actions against defaulters.[240] These omissions may render the Revised Text binding in name only.

Though a meaningful step toward a holistic global response to plastic pollution, the Revised Text stops short of establishing any firm legal basis for regulating the sources of airborne microplastics. The emerging treaty currently recognizes the atmosphere only as a secondary pathway for microplastic pollution. Instead of a direct, centralized focus on air, the treaty addresses atmospheric contamination through "indirect entry points," specifically within its full life-cycle approach and general provisions aimed at preventing releases and leakages into the environment at large.[241] The ramifications of such an omission are particularly serious for nations, such as the UK, that cannot readily look to the emerging treaty as a model framework

236. *Id.* at art 7(2)(d).

237. Ida Järlskog, Occurrence of Traffic-Derived Microplastics in Different Matrices in the Road Environment (2022) (Ph.D. dissertation, Chalmers University of Technology) (ProQuest).

238. *Revised Text, supra* note 231, at art. 4.

239. *Id.* at art.14, 15.

240. Reporting obligations under the draft Global Plastics Treaty (often referenced under Article 15) are designed to ensure transparency, accountability, and the effectiveness of measures taken to combat plastic pollution across its entire lifecycle. As of mid-2025, negotiations indicate that these obligations will be a core, mandatory component of the treaty, though the exact level of detail remains a contention among parties.

241. The draft global plastics treaty (Part II, Section 7) identifies indirect atmospheric contamination as unintentional emissions from the plastic lifecycle, specifically highlighting microplastics from tyre and textile wear, hazardous volatile organic compounds (VOCs), and the incineration of waste. These pathways are addressed under "Releases and leakages" by requiring national plans to control microplastics and hazardous chemical emissions throughout the full life cycle.

for regulating domestic sources of plastic pollution reaching the air. Until such time as airborne microplastics are explicitly and holistically dealt with in global legal instruments, they will continue to be under-regulated and a poorly-governed dimension of the plastic pollution crisis.[242]

V. AIRBORNE PLASTICS, TECHNOLOGY, INNOVATION, AND SUSTAINABLE DEVELOPMENT GOALS IN THE UK

The challenge of airborne microplastics is intricately linked to several Sustainable Development Goals (SDG). Addressing airborne microplastics requires a holistic approach that considers the interconnectedness of environmental, social, technological, and economic factors. The SDGs provide a blueprint for a sustainable future by addressing interconnected issues such as poverty, inequality, climate change, and social justice. SDGs 3 (Good Health and Well-being), 6 (Clean Water and Sanitation), 11 (Sustainable Cities and Communities), 13 (Climate Action), 14 (Life Below Water), and 15 (Life on Land) are particularly relevant to the challenge of airborne microplastics.[243] The United Kingdom's (UK) commitment to the SDGs is evident in its active participation in the global framework established by the 2030 Agenda.[244] Several major economies—including the UK—are investing in and implementing sustainable technological innovations to address the growing problem of airborne plastic pollution.[245] These initiatives aim to capture, filter, and reduce the generation of microplastics in the environment to aid its governance.[246] There are good examples of technological innovations that offer promising solutions to the present challenge. One example is air filtration systems. High-efficiency

242. Justine Ammendolia et al., *Atmospheric Microplastics Must Be Addressed in the Global Plastics Treaty*, 3 CAMBRIDGE PRISMS: PLASTICS, June 5, 2025, at 1, 3.

243. Nida Tabassum Khan, *Environmental Impact of Solid Waste Landfilling in Balochistan–A Risk Assessment for SDG 3 (Good Health and Well-Being), SDG 6 (Clean Water and Sanitation), SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), SDG 14 (Life Below Water) and SDG 15 (Life on Land)*, 2 GREEN BLDGS. & MATERIALS, Dec. 19, 2024, at 1, 1 (2024); Govindhasamay R. Varatharajan et al., *Emerging Contaminants: A Rising Threat to Urban Water and a Barrier to Achieving SDG-Aligned Planetary Protection*, 17 WATER 2367, 2368 (2025); Mariana Rodrigues et al., *Microplastics in Freshwater Systems: The Current Status to Achieve the Sustainable Development Goals Until 2030*, 18 INTEGRATED ENV'T ASSESSMENT & MGMT. 289, 290 (2022).

244. *See generally* Bandy X. Lee et al., *Transforming Our World: Implementing the 2030 Agenda Through Sustainable Development Goal Indicators*, 37 J. PUB. HEALTH POL'Y S13 (2016).

245. Mariana Rodrigues et al., *Microplastics in Freshwater Systems: The Current Status to Achieve the Sustainable Development Goals Until 2030*, 18 INTEGRATED ENV'T ASSESSMENT & MGMT. 289, 290 (2022).

246. Ben Williams et al., Embedding Citizens Within Airborne Microplastic and Microfibre Research, CAMBRIDGE PRISMS: PLASTICS, June 28, 2023, at 1, 2.

particulate air filters and specialized filters designed to capture microplastics are being installed in various settings, including public spaces, transportation systems, and industrial facilities.[247] Interestingly, there exists sensor technologies designed for microplastic detection. This can continuously monitor air quality and detect the presence of microplastics.[248] Another aspect of innovation is the design of sustainable materials.[249]

There is ongoing research on biodegradable and compostable alternatives to traditional plastics, reducing the root generation of microplastic waste.[250] If and where alternative materials are produced, the potential of the release of microplastics from plastic production, packaging, use, or even disposal will be greatly minimized, and the SDG cause would also be promoted. An example can be seen under SDG 11, Sustainable Cities and Communities.[251] The presence of airborne microplastics in urban environments pose significant risks to public health and quality of life.[252] Microplastics can accumulate in urban areas, contaminating air, water, and soil.[253] Addressing this issue requires sustainable urban planning, waste management strategies, and investments in air quality monitoring and improvement.

There are about ten targets for SDG 11.[254] Target 11.6, which aims to "reduce the adverse per capita environmental impact of cities," presents a significant legal challenge.[255] Addressing this target effectively requires a robust legal framework to guide urban development and environmental management. Existing environmental legislation, such as air quality

247. *Cf.* Chiu-Fan Chen et al., *Efficacy of HEPA Air Cleaner on Improving Indoor Particulate Matter 2.5 Concentration*, 19 INT'L J. ENV'T RSCH. & PUB. HEALTH 11517, 11525 (2022).

248. Ifeanyi Kingsley Egbuna et al., *Advancing Environmental Sustainability Through Emerging AI-Based Monitoring and Mitigation Strategies for Microplastic Pollution in Aquatic Ecosystems*, 22 WORLD J. BIOLOGY PHARMACY & HEALTH SCI. 91, 97 (2025).

249. *Id.*at 98.

250. Such as bioplastics, starch-based plastics, bamboo, and aliphatic polyesters. *See* "ZeroWaste," *The Contribution of Bioplastics to Environmental Sustainability*, GRAPHIC LEADER (Apr. 24, 2023) https://web.archive.org/web/20230424194535/https://www.thegraphicleader.com/opinion/columnists/the-contribution-of-bioplastics-to-environmental-sustainability.

251. G.A. Res. 70/1, ¶ 11.6 (Sept. 25, 2015) (establishing Target 11.6: "By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.").

252. *See* Wenjing Wu et al., *Characterization of Airborne Microplastics and Health Risks in High-Temperature Urban Streets: A Case Study of Nanjing City*, 496 J. HAZARDOUS MATERIALS, Sept. 15, 2025, at 1.

253. *Id.*

254. G.A. Res. 71/313, Work of the Statistical Commission Pertaining to the 2030 Agenda for Sustainable Development (July 6, 2017).

255. G.A. Res 70/1, Transforming Our World: The 2030 Agenda for Sustainable Development, (Sept. 25, 2015), Goal 11, Target 11.6.

standards and waste management regulations, provides the foundation for addressing urban environmental impacts. However, these laws may need to be strengthened to align with the specific goals of SDG 11.6. Furthermore, better urban-planning laws could promote sustainable development practices and reduce urban sprawl. Striking a balance between economic development and environmental protection is challenging. Legal frameworks must be designed to promote sustainable development that addresses both economic and environmental goals.[256] Investments in sustainable infrastructure—such as improved waste management systems and green spaces—can help mitigate the impact of airborne microplastics on urban environments.[257]

Also, central to addressing airborne microplastics is a robust research agenda aimed at understanding the behaviour, sources, and impacts of these particles. Investments in research and development are crucial for unravelling the complexities of microplastic formation, transportation, and deposition.[258] Technological advancements, particularly in the realms of air filtration, sensor technology, and materials science are promising for developing effective solutions.[259] Moreover, a transition to a circular economy focused on reducing, reusing, and recycling plastics is essential to curtailing the generation of microplastics. Together, these measures can promote SDG 15, Life on Land.[260] It is important to note that unrecycled plastics, which have degraded into airborne microplastics, can contaminate soil and impact terrestrial ecosystems, affecting plant growth, biodiversity, and soil health.[261] Under Target 15.1, protecting and restoring ecosystems mitigates the impacts of microplastic pollution. For example, healthy forests

256. Patricia Kameri-Mbote & Nkatha Kabira, *Engendering the Legal Framework for Environmentally Sustainable Development: Some Reflections*, 53 ENV'T POL'Y & L. 335, 336 (2023).

257. Tyler Irving, *Can Green Infrastructure Keep Microplastics Out of the Environment?*, WATER ONLINE, https://www.wateronline.com/doc/can-green-infrastructure-keep-microplastics-out-of-the-environment-0001 (last visited Apr. 8, 2026).

258. Xinran Zhao et al., *Airborne Microplastics: Occurrence, Sources, Fate, Risks and Mitigation*, 858 SCI. TOTAL ENV'T, Feb. 1, 2023, at 1.

259. Press Release, U.N. Env't Programme, Smart New Technologies Can Play a Vital Role in Addressing Plastic Pollution Crisis in Our Waters – New Study (Dec. 17, 2020), https://www.unep.org/news-and-stories/press-release/smart-new-technologies-can-play-vital-role-addressing-plastic; *cf.* Christine C. Gaylarde et al., *Indoor Airborne Microplastics: Human Health Importance and Effects of Air Filtration and Turbulence*, 3 MICROPLASTICS 653 (2024).

260. Kristian Syberg et al., *Circular Economy and Reduction of Micro(nano)plastics Contamination*, 5 J. HAZARDOUS MATERIALS ADVANCES, 2022, at 1, 3.

261. P.D. Dissanayake et al., *Effects of Microplastics on the Terrestrial Environment: A Critical Review*, 209 ENV'T RSCH., 2022, at 1, 8 (noting that while microplastics are known to alter soil physicochemical properties and rhizosphere interactions, the specific mechanisms of plant uptake and the long-term ecological impacts on terrestrial vegetation remain poorly understood and require more rigorous, multi-site field experimentation)

and wetlands can act as natural filters, removing pollutants (including airborne plastics) from the environment.[262]

Ultimately, fostering collaboration between academia, industry, and government is imperative for accelerating the translation of research findings into practical applications. Public-private partnerships can facilitate knowledge exchange, resource sharing, and the development of innovative solutions.[263] Additionally, supportive policy frameworks, including incentives for research and development, can stimulate investment in the creation and deployment of microplastic mitigation technologies.[264] The UK can position itself as a global leader in addressing the challenge of airborne microplastics by embracing SDGs in its innovation and investing in research and development.[265] Such efforts not only contribute to environmental sustainability but also create new economic opportunities and enhance the nation's reputation as a champion of technological advancement.

VI. GAPS AND REGULATORY CHALLENGES

Existing environmental regulations in the United Kingdom (UK) have primarily focused on managing plastic pollution in terrestrial and aquatic environments. Specific regulations addressing airborne plastics remain scarce, even though they represent a distinct category of microplastics.[266] Airborne plastics have the potential to travel long distances, making them a cross-boundary issue.[267] Existing regulations may not be fully equipped to address the complexities of airborne plastic pollution that transcends local and national boundaries.[268] The challenge for regulators also extends to

262. Sunaga Natsu et al., *Accumulation of Airborne Microplastics on Forest Canopy Leaves: Insights from Trichomes and Epicuticular Waxes*, RSCH. SQUARE, Nov. 29, 2023, at 1, 2. Forest canopies capture billions of particles annually through adsorption onto leaf surfaces and epidermal waxes. Similarly, wetlands act as natural buffers, trapping atmospheric microplastics in their sediments and vegetation. *Id.*

263. Ahmad Luthfi & Muhammad Faqih Naufal, *Mapping the Public-Private Partnership Researches in Waste Management: A Bibliometric Analysis*, 1 J. TRANSFORMATIVE GOVERNANCE & SOC. JUST. 77, 81 (2023).

264. ORG. FOR ECON. COOP. & DEV., POLICIES TO REDUCE MICROPLASTICS POLLUTION IN WATER: FOCUS ON TEXTILES AND TYRES 1, 13 (2021).

265. *See* Dr. Stephanie Wright, *Understanding UK Airborne Microplastics Pollution: Sources, Pathways and Fate*, IMPERIAL COLL. LONDON, https://www.imperial.ac.uk/school-public-health/environmental-research-group/research/microplastics/understanding-uk-airborne-microplastics/ (last visited Apr. 3, 2026).

266. COMM. ON THE TOXICITY OF CHEMICALS IN FOOD, CONSUMER PRODUCTS AND THE ENVIRONMENT, SUB-STATEMENT ON THE POTENTIAL RISK(S) FROM EXPOSURE TO MICROPLASTICS: INHALATION ROUTE 1, 26 (2024).

267. Yulan Zhang et al., *Atmospheric Microplastics: A Review on Current Status and Perspectives*, 203 EARTH SCI. REV., Feb. 2020, at 1, 2.

268. Ageel et al., *supra* note 24.

developing strategies and technologies capable of targeting and removing microplastics efficiently across various environments.

Many people may not be aware of the risks posed by airborne microplastics, limiting public support for regulatory measures and behavioural changes. Therefore, encouraging consumers to adopt sustainable practices and reduce their reliance on plastic products can be challenging.[269] There is also potential resistance from industries that rely on plastic products.

A primary challenge is international coordination. Where there is harmony in international regulations and standards for addressing airborne plastics, the UK could also benefit. This is particularly necessary due to the transboundary nature of airborne plastics. Even with such coordination, ensuring compliance becomes another hurdle.[270] Stricter and harsher penalty provisions in regulations can be compelling enough, but proper interpretation of such regulations for compliance is another aspect of the possible enforcement challenges.[271] Other regulatory challenges include monitoring and detection.[272] Developing accurate and affordable methods for monitoring and detecting airborne microplastics remains a challenge, not to mention the other related challenge of developing effective technologies for capturing and removing microplastics from the atmosphere.[273]

At a theoretical level, understanding the underlying drivers of microfibre fragmentation is paramount for devising comprehensive and targeted solutions. While existing legal regulations in the UK may not explicitly mention airborne plastics, they provide a foundation for managing plastic waste, which could indirectly contribute to addressing airborne plastic sources. Regulatory authorities can interpret and apply existing regulations to address novel challenges without the need for entirely new legislation. This perspective presents a challenge too; for instance, traditional cleanup methods designed for larger plastic items are likely ineffective for microplastics due to their small size.[274] Common methods such as manual removal or surface skimming may not adequately capture or address the vast

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269. *See* Laura Elizabeth Lansdowne, *Up in the Air: What Do We Know About Airborne Microplastics?*, TECH. NETWORKS (Dec. 9, 2024), https://www.technologynetworks.com/applied-sciences/articles/up-in-the-air-what-do-we-know-about-airborne-microplastics-393008.

270. *See generally International Cooperation on Plastic Pollution | Plastics and the Environment Series*, GENEVA ENV'T NETWORK, https://www.genevaenvironmentnetwork.org/resources/updates/international-cooperation-on-plastic-pollution/ (last updated Aug. 15, 2025).

271. *See id.*

272. Ageel et al., *supra* note 24.

273. Alexey Rednikin et al., Airborne Microplastics: challenges, Prospects, and Experimental Approaches, Atmosphere, Nov. 15, 2024, at 1, 21–22.

274. *Id.* at 22.

number of dispersed microplastic particles.[275] Implementing large-scale cleanup efforts may carry the risk of unintended ecological consequences. Furthermore, disturbing ecosystems during cleanup operations could potentially cause more harm than good, disrupting natural balance and biodiversity.[276] Policymakers may face difficulties in formulating effective regulations without comprehensive data on potential health risks.[277] Now, while the focus on health effects from ingestion and inhalation of airborne plastics emphasizes the importance of specific evidence in guiding policymaking, the lack of robust evidence-based data may hinder the ability to implement targeted measures to protect public health.[278]

The Microfibre Consortium's fibre-reduction roadmap highlights existing efforts within the industry to reduce microplastic releases, particularly from clothing.[279] Leveraging and expanding such initiatives can be seen as an easy win in the sense that they provide a foundation for addressing airborne plastics without starting from scratch. From a practical perspective, regulatory frameworks, waste management strategies, and sustainable production practices can be instrumental in curbing the release of microfibres into the environment.[280] Since microplastics often result from the fragmentation of larger plastic items over time, reducing the production and consumption of single-use plastics and other plastic products, including microfibre, will directly impact the primary source of airborne microplastics.[281]

Microbeads—tiny plastic particles used in personal care products—contribute to microplastic pollution when they enter bodies of water and later become airborne.[282] Phasing out and eliminating the use of microbeads directly reduces their contribution to airborne microplastics. Strengthening the current strategy for tackling microbeads is fundamental to controlling their dispersion in the environment.

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275. *Id.* at 21.

276. Keely Maxwell et al*., How Clean is Clean: A Review of the Social Science of Environmental Cleanups*, 13 ENV'T RSCH. LETTERS, 2018, at 1, 13.

277. *Id.*

278. *Id.*

279. R. Rathinamoorthy & S. Raja Balasaraswathi, *Microfiber Pollution Prevention—Mitigation Strategies and Challenges*, *in* MICROFIBER POLLUTION 205 (Subramanian Senthilkannan Muthu ed., 2022).

280. Irena Twardowska & William Lacy, *II.1 Regulatory Frameworks as an Instrument of Waste Management Strategies*, *in* SOLID WASTE: ASSESSMENT, MONITORING & REMEDIATION 91 (Irena Twardowska ed., 2004).

281. Kim Borg et al., *Curbing Plastic Consumption: A Review of Single-Use Plastic Behaviour Change Interventions,* 344 J. CLEANER PROD., 2022.

282. E.C. Emenike et al., *From Oceans to Dinner Plates: The Impact of Microplastics on Human Health*, 9 HELIYON, Sept. 2023, at 1, 2–3.

Despite the overwhelming implications of microfibres on ecosystems and human health, acknowledging the complexity of the issue is essential. Finding complete replacements for microplastics may be technically challenging or economically unfeasible in certain industries and applications. Addressing the issue of plastic pollution necessitates the provision of practical alternatives tailored to specific needs met by various plastic products.[283] This approach offers more promising outcomes compared to indiscriminate bans that overlook factors such as replaceability and affordability. Implementing effective pollution and waste management strategies acknowledges the existing use of microplastics and focuses on minimizing their environmental impact. This pragmatic approach, aligned with a multifaceted strategy based on the Theory of Planned Behaviour, addresses the immediate challenges while allowing for a transition toward more sustainable alternatives over time.[284] It also underscores the importance of regulatory/administrative instruments and Market-Based Instruments.[285]

VII. AIRBORNE PLASTICS AND THE CASE AGAINST SYNTHETIC FIBRES

A recent study conducted in London discovered that the vast majority (92%) of airborne microplastic fibres analysed were found to have come from the wear and tear of clothing, upholstery, and carpets, with only 8% coming from other sources, including the degradation of waste such as plastic bags and polystyrene foam.[286] The legal implication of this study is that bans, taxation, or any form of effective control of synthetic fibre will result in reducing airborne plastic pollution in the United Kingdom (UK) by 90% (using Birmingham as a baseline for other UK cities, towns, and villages).[287] This Part will therefore focus on the importance of regulating synthetic fibre as a panacea for tackling airborne plastics in the UK.

Synthetic fibres, such as polyester, nylon, and acrylic, have become common in the textile industry due to their durability, affordability, and performance properties.[288] However, the widespread use of these materials

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283. *See* Joana C. Prata et al., *Solutions and Integrated Strategies for the Control and Mitigation of Plastic and Microplastic Pollutio*n, 16 INT'L J. ENV'T RSCH. & PUB. HEALTH, July 7, 2019, at 3.

284. Cyprian Emeka Adibe et al., *Understanding the Psychology and Legal Perspective of Plastic Dependency in Nigeria*, 43 CURRENT PSYCH. 2630, 2631 (2023).

285. Daniel Slunge & Francisco Alpizar, *Market-Based Instruments for Managing Hazardous Chemicals: A Review of the Literature and Future Research Agenda*, SUSTAINABILITY, Aug. 2019, at 1, 13–15.

286. S.L. Wright et al., *Atmospheric Microplastic Deposition in an Urban Environment and an Evaluation of Transport*, 136 ENV'T INT'L, Dec. 2020, at 1, 5–6.

287. Ageel et al., *supra* note 24.

288. VEETRENDS, *What Is Synthetic Fabric: Understanding the Basics and Beyond*, https://www.veetrends.com/blog/what-is-synthetic-fabric (last visited Feb. 11, 2026).

has significant environmental implications, particularly in terms of microplastic pollution. The shedding of microfibres during the production, use, and laundering of these textiles releases a substantial quantity of microplastics into the environment, with a portion becoming airborne. Once released into the environment, microplastics can become airborne, contributing to the growing problem of microplastic pollution in the atmosphere. Research shows that macrofibres from clothes laundering are the main source of primary microplastics in oceans.[289]

Addressing this issue necessitates a multilayered approach that encompasses material innovation, improved textile production processes, and effective waste management. The Macrofibre Consortium contributes to addressing the challenge of airborne microplastics.[290] This can be seen in the roadmap to reduce microfiber waste. The development of sustainable alternatives to synthetic fibres, such as natural fibres like cotton, linen, and wool, or recycled polyester derived from plastic waste, can significantly reduce microplastic emissions.[291] However, it is essential to conduct thorough life cycle assessments to evaluate the environmental impacts of these alternatives, as some may have their associated challenges.

Advancements in textile manufacturing technologies are crucial for minimizing fibre shedding.[292] Closed-loop systems that capture microfibers during washing, as well as innovations in fabric design and treatment, can help to reduce microplastic release. Furthermore, promoting the repair and reuse of textiles can extend the lifespan of garments, thereby reducing the demand for new production and associated microplastic emissions. Consumer education and awareness are equally important. Elaborating on this idea, synthetic fibres from textiles, released during washing and wear, contribute significantly to microplastic pollution.[293] Reducing the use of synthetic materials in textiles and implementing filtration systems in washing machines can curtail the release of microfibers.[294] This is a foundational approach to addressing airborne microplastics. Moreover, it aligns with the broader strategy of changing human behaviour and reducing plastic waste, as

289. Christine Gaylarde et al., *Plastic Microfibre Pollution: How Important Is Clothes' Laundering?*, 7 HELIYON, May 2021, at 1, 1.

290. Centre for Ecology & Hydrology, *Understanding UK Airborne Microplastic Pollution: Sources, Pathways and Fate*, UK RSCH. & INNOVATION (last visited May 12, 2026).

291. Ageel et al., *supra* note 24.

292. T. Stanton et al., *Shedding off-the-Grid: The Role of Garment Manufacturing and Textile Care in Global Microfibre Pollution*, 428 J. CLEANER PROD., Oct 2023, at 1, 6.

293. S. Choi et al., *The Effect of the Physical and Chemical Properties of Synthetic Fabrics on the Release of Microplastics During Washing and Drying*, 14 POLYMERS, Aug. 2022, at 1, 2.

294. F.S. Cesa et al., *Synthetic Fibers as Microplastics in the Marine Environment: A Review from Textile Perspective with a Focus on Domestic Washings*, 598 SCI. TOTAL ENV'T 1116, 1126 (2017).

discussed by scholars.[295] In reality, a governance gap exists in this respect, since the use of synthetic fibres in the UK is still unregulated. By understanding the environmental impacts of synthetic fibres, consumers might be able to make better-informed choices and support the development of more sustainable textile products. Proper care and maintenance of textiles, such as washing at lower temperatures and using microfiber filters on washing machines, could also reduce microplastic release. An all-inclusive approach that addresses the entire lifecycle of textiles, from production to disposal, is essential for mitigating the impact of synthetic fibres on airborne microplastics.

From the foregoing, one promising approach is the implementation of a tax on synthetic fibre products. The UK Environmental Audit Committee has called on clothing manufacturers to take responsibility for the waste they create.[296] The Committee also proposed a tax on synthetic materials to incentivize the use of more sustainable alternatives.[297] This policy measure could incentivize the production and consumption of more sustainable alternatives, thereby reducing the release of microplastics into the atmosphere. A tax on synthetic fibres would create a financial disincentive for the production and consumption of these materials.[298] This could lead to a shift towards natural fibres, such as cotton, linen, and wool, which are less likely to shed microplastics. While implementing a tax on synthetic fibres may face challenges—such as potential impacts on industries and consumers—the potential benefits in terms of reducing airborne microplastic pollution and promoting a more sustainable future outweigh the drawbacks.

CONCLUSION

This Article explored the evolving legal frameworks addressing airborne plastics, with a focus on the United Kingdom (UK) and global initiatives. Recent legislative developments, including the Environment Act 2021, reflect a commitment to tackling plastic pollution broadly. The introduction of the Plastic Packaging Tax and the ban on single-use plastic items demonstrate a proactive approach toward reducing the environmental impact

295. A.L. Alison et al., *Reducing Plastic Waste: A Meta-Analysis of Influences on Behavior and Interventions*, 380 J. CLEANER PRODUCTION, OCT. 2022, at 1, 15; Adibe, *supra* note 284, at 2631.

296. Jessica Taylor, *Fast Fashion Tax on Synthetic Materials to be Considered as MPs Crack Down on Clothes Designers to Prevent Plastic Pollution*, THE STANDARD (Feb. 19, 2019), https://www.standard.co.uk/futurelondon/theplasticfreeproject/fast-fashion-plastic-tax-a4070241.html.

297. ENVIRONMENTAL AUDIT COMMITTEE, FIXING FASHION: CLOTHING CONSUMPTION AND SUSTAINABILITY, 2019, HC 1952, 39 (2019).

298. *See* Alexander Bismarck et al., *Green Composites as Panacea? Socio-Economic Aspects of Green Materials*, 8 ENV'T, DEV. & SUSTAINABILITY 445, 446 (2006).

of plastics but fall short of being the ultimate solution for the regulation of airborne plastics.[299] Globally, several key instruments play a crucial role. The Basel Convention regulates the transboundary movement of hazardous waste, including plastic, while the Stockholm Convention addresses persistent organic pollutants associated with plastics. The need for a global legal framework is underscored by the cross-boundary nature of airborne plastics, which can traverse large distances and impact ecosystems worldwide. This Article canvasses direct regulations and legislation in the UK that will take into consideration the unique and amorphous nature of airborne plastics and their negative implications for societal well-being.

Airborne microplastics pose a significant threat to human health and the environment. The presence of microplastics in the atmosphere is linked to a range of issues, including respiratory problems, ecosystem disruption, and climate change.[300] The production and use of synthetic fibres contribute substantially to airborne microplastic pollution.[301] The shedding of microfibers during the production and use of textiles is a primary source of microplastics in the environment. Hence, some remedies like the Extended Producer Responsibility (EPR)—which is a crucial tool for addressing packaging waste—would require further development to effectively tackle airborne microplastics.[302] While EPR incentivizes packaging reduction and recycling, its direct impact on airborne microplastics is limited. In the case of Deposit Return Schemes (DRS), a successful implementation not only increases recycling rates but potentially reduces the sources of plastic pollution. DRS are generally specific to certain types of containers, like beverage bottles.[303] Though it addresses littering and encourages recycling, its direct impact on airborne plastics may be limited, as it focuses on a subset of plastic waste.

In the UK, existing legislation primarily focuses on addressing plastic pollution in general, including measures related to marine litter and single-use plastics. While these regulations may indirectly contribute to addressing some forms of microplastic pollution, they may not specifically target airborne microplastics. The limitations of tools like EPR and DRS, though

299. Ana L. Patricio Silva et al., *Rethinking and Optimising Plastic Waste Management Under COVID-19 Pandemic: Policy Solutions Based on Redesign and Reduction of Single-Use Plastics and Personal Protective Equipment*, 742 SCI. TOTAL ENV'T, June 4, 2020, at 1, 2; Ryann Wong, *Reducing Single-Use Plastic Waste: A Better Alternative to the Reduce Act Tax Proposal*, 14 HASTINGS SCI. & TECH. L.J. 149, 160 (2023).

300. Prata, *supra* note 15, at 117.

301. Hassan Khalid Ageel et al., *Microplastics in Indoor Air from Birmingham, UK: Implications for Inhalation Exposure*, 362 ENV'T POLLUTION, 2024, at 1, 2.

302. United Nations Environment Programme, *supra* note 227.

303. AGNES BÜNEMANN ET AL., GIZ, DEPOSIT-REFUND SYSTEMS (DRS) FOR PACKAGING: GIVING PACKAGING WASTE AN ECONOMIC VALUE 1 (2018).

effective in packaging waste and litter management, show that there is a need for a more tailored approach that tries to address the issue of airborne microplastics.

To tackle this impending issue, the UK government should seriously consider implementing policies that would ban the production and use of synthetic fibres. Taking this step would easily eliminate the primary source of airborne microplastic pollution.[304] It is in line with the precautionary principle, which places more priority on the prevention of environmental harm rather than reducing it in the face of scientific uncertainty. In addition, policies that put a substantial tax on the production and use of synthetic fibres can be implemented in situations where banning it does not appear feasible. This market-based approach will likely push manufacturers into seeking more sustainable alternatives. Also, the UK should allocate funds for studying the health impact of inhaling airborne microplastics.[305] Understanding the impact it has on human health would greatly help when future regulations and strategies are being made. Most importantly, there is a need to educate the public on the implications and impact of airborne microplastics. Enlightening the public would help with their choice of natural fibre textiles over synthetic ones, thereby reducing the number of microfibers in the environment.[306] Implementing these measures would help in mitigating the environmental and health risks associated with airborne microplastics. It will also position the UK as a leading country in the fight against these emerging pollutants. For this reason, a comprehensive and effective legislative framework is important if the complexities of microplastic pollution are to be addressed effectively.

As scientific understanding advances, there will likely be a need to integrate measures specifically targeting airborne microplastics into future environmental policies. The issue of plastic pollution, including microplastics, is still gaining traction and there is a need for sensitization, both within the UK and globally, on the environmental implications of airborne plastics. International forums and collaborations are exploring ways to enhance regulations and coordinate efforts to address plastic pollution expansively; however, direct and specific regulations on airborne microplastics are still in the early stages of consideration. Future

304. Esther Kentin & Gaia Battaglia, *Policies and Perspectives on Regulating Microplastic Fibre Pollution*, 25 POLLUTING TEXTILES 265, 276 (1st ed. 2022).

305. Luís Fernando Amato-Lourenço et al., *An Emerging Class of Air Pollutants: Potential Effects of Microplastics to Respiratory Human Health?*, 749 SCI. TOTAL ENV'T, 2020, at 1, 5–6.

306. Joshua Khorsandi et al., *From Ocean to Table: How Public Awareness Shapes the Fight Against Microplastic Pollution*, 9 URBAN SCI., 2025, at 1, 16.

developments may see the integration of measures to address airborne microplastics into broader environmental policies and regulations.