



Department
for Environment
Food & Rural Affairs

Post-implementation review: the Environmental Protection (Microbeads) (England) Regulations 2017

May 2024



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Food & Rural Affairs

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Presented to Parliament pursuant to Section 5 (“Review”) of the Environmental Protection (Microbeads) (England) Regulations 2017

We are the Department for Environment, Food and Rural Affairs. We are responsible for improving and protecting the environment, growing the green economy, sustaining thriving rural communities and supporting our world-class food, farming and fishing industries.

We work closely with our 33 agencies and arm's length bodies on our ambition to make our air purer, our water cleaner, our land greener and our food more sustainable. Our mission is to restore and enhance the environment for the next generation, and to leave the environment in a better state than we found it.



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ISBN: 978-1-5286-4914-8

E03129892

Printed on paper containing 40% recycled fibre content minimum

Printed in the UK by HH Associates Ltd. on behalf of the Controller of His Majesty's Stationery Office

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Title: PIR of The Environmental Protection (Microbeads) (England) Regulations 2017 PIR No: PIR-63298 Original IA/RPC No: Defra2083 Lead department or agency: Department for Environment Food and Rural Affairs Other departments or agencies: None Contact for enquiries: Email: marinelitter@defra.gov.uk	Post Implementation Review
	Date: 19/04/2023
	Type of regulation: Domestic
	Type of review: Statutory
	Date measure came into force: 18/06/2018
	Recommendation: Keep
	RPC Opinion: Green

1. What were the policy objectives of the measure?

The 2017 regulations were introduced to prohibit the manufacture and sale of ‘rinse-off’ cosmetics and personal care products containing microbeads. The intervention was designed to protect the environment and food supply from further pollution from microbeads, foster consumer confidence that the products they buy will not contain plastic microbeads which can harm the environment, support the cosmetics industry by setting a level playing field while ensuring a suitable timescale for implementation to minimise impact on the industry, and to set an example for other countries and encourage wider adoption of this type of legislation to regulate plastic pollution from microbeads. The measure contributes to the UK Marine Strategy and the Government’s vision for ‘clean, healthy, safe, productive and biologically diverse ocean and seas’. The measure was not intended to address all sources of intentionally added microplastics. The policy objectives are high level and could have benefited from a simplified SMART objective such as ‘rinse-off personal care products containing microbeads are no longer manufactured or sold in England by 30th June 2018’. This is the best indicator of success, and we are confident that it has been achieved as detailed below.

2. What evidence has informed the PIR?

The evidence and analysis underpinning this PIR is from a range of sources; from stakeholders, journal articles, surveys which included eNGOs and industry, direct discussions with trade associations, Trading Standards and a range of local authorities. The assessment of the policy was compared against the assumptions and estimates of costs and benefits set out in the original impact assessment.

Two surveys were prepared - one for businesses and industry participants and one for environmental NGOs. There were thirteen questions for businesses and ten for NGOs. Both surveys sought views on the extent to which the microbead ban had succeeded in meeting its objectives, how effectively the policy was implemented, unintended consequences and how it could be improved or whether there were any gaps the legislation didn't cover. Environmental NGOs were also asked about enforcement, whether they thought the ban has impacted public awareness of microplastics and the plastic pollution issue and what else the government could do to reduce emissions of microbeads. Business and industry respondents were asked whether the ban had influenced their use of microbeads in products and about the alternatives to microbeads – what alternatives products had switched to, why and what the associated costs were. They were also asked whether the ban had impacted sales and consumer prices and whether the regulation influenced their use of plastic microbeads in markets outside the UK. Responses were collected through a mix of Likert scales and open text responses.

We contacted three major retailers, two industry leaders and two major trade associations for cosmetics representing businesses on a UK and European level, inviting them to answer the first survey. We also contacted four environmental NGOs, inviting them to answer the second survey. We chose these organisations from stakeholders who had engaged with Defra during the development of the original legislation. The respondents were given two weeks to answer the appropriate survey. We did not survey any small-medium enterprises and depended on the Trade Associations to provide such perspectives. We received responses from two retailers, one UK Trade Association, two personal care product manufacturers and all four environmental NGOs. After an initial analysis, we offered a follow-up virtual meeting to businesses and one NGO to explore their responses in greater detail and gather any further relevant information; we received additional information from the NGO, two businesses that had responded to the survey and one business that had not. Further to this, we held discussions with Trading Standards who engaged with 21 local authorities in a Trading Standards Northwest meeting to help us understand enforcement.

A rapid evidence review of scientific publications and media reporting were conducted to detail the presence of microbeads in the environment since the ban and provide updates to evidence presented in the impact assessment regarding the potential harm from microplastics. Search terms were agreed and used to review the literature on Scopus and Google Scholar. Where there were high numbers of papers returned in Google Scholar, the first 100 were reviewed for relevance. A total of 826 search results were sifted across both search engines, with 39 papers identified to review in further detail. Of those, three papers included information on the presence of microbeads after the 2018 ban, one which sampled microbeads but the date on which the study was conducted was ambiguous, and eight papers included sampling of microbeads prior to the ban. Seven papers included sampling of microplastics but did not

reference microbeads. The remaining papers detailed evidence of harm from microplastic exposure. Environmental monitoring data from before and after the ban is therefore limited. Furthermore, it is not currently possible to identify the products of origin for microbeads identified in the environment. The presence of microbeads in rinse-off personal care products sold in England was therefore considered a better indicator of the effectiveness of the ban.

3. To what extent have the policy objectives been achieved?

Within the scope of the ban, evidence suggests that it has been successful in meeting its objectives and should remain in force to keep microbeads out of rinse-off personal care products on the market in England – mitigating any risk of their reintroduction. It has been noted that microbead ingredients (e.g. polyethylene) which were used in a range of products appear to no longer be included in rinse-off personal care products available on the market in England. Whilst many companies (e.g. Unilever) took voluntary action to remove microbeads from their products before the ban, the Environmental Audit Committee in 2016 highlighted the need for legislation to implement a universal approach to drive wider changes in practice. The ban was recognised by a UK trade association for cosmetics and personal care products for setting science based definitions that created a level playing field for all companies placing the rinse-off personal care products on the market. It provided a single, common definition of microbeads and plastic. After the legislation for England came into force, the Devolved Administrations passed similar laws between 2018 and 2019. Many other countries have also since adopted their own legislation to tackle microbeads, with one retailer commending the role that the legislation in England had on starting a broader global trend toward awareness of microbead pollution and more generally the impacts of plastic in the natural environment. While responses to our surveys generally reported that the ban had succeeded in meeting the expectations of industry and NGOs, some concerns were raised by NGOs that the ban was too limited in scope since intentionally added microplastics can also be found in leave on personal care products and other consumer goods. Defra has commissioned research to assess the scale of the risks and to identify the most effective measures to address intentionally added microplastics beyond the 2018 microbead ban. It would be premature to revisit the scope of the ban without the outcomes of this research.

Sign-off for Post Implementation Review: Chief economist/Head of Analysis and Minister(s)

I have read the PIR and I am satisfied that it represents a fair and proportionate assessment of the impact of the measure.



Signed: *Alastair Johnson*

Date: 17/04/2023

Head of Analysis



Signed: *Robbie Moore*

Date: 11/04/2024

Parliamentary Under Secretary of State



Signed: *Lord Richard Benyon*

Date: 18/04/2024

Minister of State (Climate, Environment and Energy)

Further information sheet

4. What were the original assumptions?

The original impact assessment estimated an annual net cost of £0.5m over a 10-year period, made up of £0.46m for substitution to a benign alternative (for businesses) and £0.04m in enforcement costs (which fall on local trading standards authorities). No other costs were assumed. Benefits were not quantified but were assumed to outweigh costs. It was assumed that the ban would affect 1% of toothpaste and 8% of face scrub products (share of volume), as it was noted that 72% of all major personal care product companies (by number of companies not by share of output) would have ceased production and sale of products containing microbeads by the end of 2017. The original impact assessment did not consider the costs of reformulation and relabelling, as previous stakeholder engagement suggested that manufacturers could be able to phase out microbeads at no additional cost. Additionally, it was stated that reformulation and relabelling is a routine process, and the timescale of the ban should allow for manufacturers to reformulate their products as normal. It was also assumed that smaller manufacturers without such processes in place would be unlikely to use microbeads in their products. Enforcement costs were considered to be overestimated since Trading Standards Authorities take an intelligence-based approach to enforcement.

5. Were there any unintended consequences?

Although some NGOs raised concern that there may be misunderstanding in the public on what the ban entailed, we do not consider there to have been any unintended consequences of this ban itself.

6. Has the evidence identified any opportunities for reducing the burden on business?

Based on the limited scope of the ban and the voluntary removal of microbeads from affected products by many personal care product companies prior to the ban entering into force, costs to businesses were small. Two retailers responding to the survey reported no significant change to consumer prices, implying that the policy was implemented at little to no cost, and there was no impact on sales. No opportunities to further reduce them have been identified or highlighted in the survey responses.

7. How does the UK approach compare with the implementation of similar measures internationally, including how EU member states implemented EU requirements that are comparable or now form part of retained EU law, or how other countries have implemented international agreements?

Intentionally added microplastics in cosmetics and personal care products have also been subject to legislative bans in the Devolved Administrations, the Netherlands, USA, Sweden, Canada, Australia,

South Korea, New Zealand, Taiwan, France, India, Italy, Thailand, Ireland, China, Argentina¹ and the European Union. Of these, the Devolved Administrations all introduced legislation between 2018 and 2019 and ten countries and the European Commission introduced legislation between 2018 and 2023. South Korea and the United States of America agreed legislation earlier with their bans on microbeads in rinse-off products taking effect from 2017.

We have critically reviewed legislation from Argentina, Australia, Canada, France, Ireland, New Zealand, Sweden, Taiwan and the United States of America, alongside the legislation of the UK's Devolved Administrations and the European Commission. Most bans cover rinse-off (or wash-off) cosmetics and/or personal care products only. This included legislation from the Devolved Administrations, which is well aligned to the legislation in England and uses the same definition for microbeads. Others went further: for example, Argentina passed Law 27602 (Productos Cosméticos Y Productos De Higiene Oral De Uso Odontológico) to ban microbeads in cosmetic and oral hygiene products of all forms. France, through Decree No 2017-291, banned both microbeads in rinse-off cosmetics and plastic stemmed cotton swabs for household use. The European Commission announced their intention to conduct a restriction covering a broader range of intentionally added microplastics, including in rinse-off personal care products, through the Registration, Evaluation and Authorisation of Chemicals (REACH) Regulation in 2018. The Environment Agency, on behalf of HMG, provided technical comments on the initial proposals which raised some concerns over the level of risk and whether REACH restriction is the right policy instrument to address identified risks. The EU developed a restriction dossier through the REACH restriction process, including revisions following statutory consultations and expert committee reviews. The legislation came into force in 2023 with a ban on the sale of cosmetic products containing microbeads beginning in October 2023. We found that all countries gave similar definitions or interpretations of microbeads in their legislation. Almost all referred to a size limit of under 5 mm within their definition of microbead and descriptions of microbeads as "solid plastic particles" that are "water insoluble" were common. The UK was one of three countries to also set out a definition of plastic, alongside France and Ireland (Microbeads (Prohibition) Act 2019).

In comparison, Australia initially supported a voluntary industry phase out of plastic microbeads in rinse of personal care, cosmetic, and cleaning products aiming for a 100% phase out which it set out under its National Waste Policy Action Plan (2019). This was industry led and overseen by the Commonwealth Department of Agriculture, Water and the Environment and the New South Wales Environment Protection Authority and reiterated through Australia's 2021 National Plastics Plan. However, whilst the success of

¹ <https://www.beatthemicrobead.org/impact/global-impact/>

this campaign has been recognised, state level bans have nonetheless followed to ensure rinse-off personal care and cosmetic products remain microbead-free into the future².

There has been limited assessment of the effectiveness of policies to tackle microbeads around the world, making it difficult to comment on the success or failure of the bans enacted in different countries. The best available example is from an independent assessment of the removal of microbeads from rinse-off care, cosmetic and cleaning products in Australia which surveyed 280 shops and online vendors to find that 99.3% of 8100 products examined were free of microbeads.³

² <https://accord.asn.au/sustainability/beadrecede/>

³ Department of Climate Change, Energy, the Environment and Water, Australian Government. 2023. Plastic microbeads. DCCEEW website. Access at: https://www.dcceew.gov.au/environment/protection/waste/plastics-and-packaging/plastic-microbeads#_2020-independent-microbead-assessment

Microbeads Post Implementation Review

Evidence Assessment

1. How effective has the ban been in achieving its objectives?

1.1 Protect the environment and food supply from further pollution

Overall, the ban has been successful in removing plastic microbeads from rinse-off personal care products as a source of plastic pollution in the environment by removing these products from the market. Industry feedback from our survey indicated that the ban, in combination with other regulations such as the proposed EU restrictions on intentionally added microplastics, which were at the time under discussion by the European Parliament, has contributed to the complete removal of microbeads in rinse-off products across all markets that they operate in. One retailer stated they no longer accepted any rinse-off products containing plastic microbeads after 2017 in advance of the ban and described the ban as meeting their expectations as solid plastic microbeads as “no longer being used” in rinse-off personal care products. It was the view of one environmental NGO that the main microplastic ingredients (Polyethylene, Polypropylene, Polyethylene Terephthalate, Polymethyl Methacrylate and Nylon) which were previously widely used in a range of rinse-off products appear to no longer be included in products available on the UK market. This is supported by a spot check that the NGO carried out in 2022 in a selection of high street stores which found that a series of rinse-off personal care products were free of known plastic ingredients⁴. This also found that non-plastic alternative ingredients were being used in a wider range of rinse-off personal care products than in checks conducted prior to the ban. Their study also examined the presence of microbeads in the ingredients listed on retailers’ websites for rinse-off personal care products known to contain microbeads during a survey they conducted in 2017. Whilst some still had microbeads listed in their ingredients online, verification through products in store and discussions with retailers indicates that this is due to outdated web content rather than an infringement of the ban and plastic microbeads are no longer in these products. A UK trade association for cosmetics and personal care products was confident that their members had reformulated their products, where required, to comply with the implementation of the UK plastic microbeads ban prior to the deadline. They noted the progress made in removing microbeads through voluntary action with the UK cosmetics industry achieving an estimated 70% reduction in the use of plastic microbeads by 2016 in advance of the ban.

⁴ <https://www.fauna-flora.org/wp-content/uploads/2023/11/Microbeads-PIR-Survey-FFI-Response-Submitted.pdf>

1.2 Foster consumer confidence that the products they buy will not harm the environment

In a brief survey of 21 local authorities in the Northwest of England, none reported receiving any customer complaints about products on the market in relation to the ban. One retailer responding to our survey noted that they were unaware of any infringements. Beyond this, evidence on whether the ban achieved this objective is limited. Heightened media coverage of plastic pollution has in part driven mounting public concern⁵, and reports indicate that shopping sustainably is becoming an increasingly high priority for consumers⁶. Over half of consumers sampled by Wella in 2021 reported that they were actively looking for more sustainable cosmetics products⁷. One manufacturer of personal care products who responded to our post implementation review survey described how they had reformulated products in advance of the legislation due to adverse publicity that microbeads were receiving. However, responses from post-implementation surveys noted that whilst public interest in the status of plastic microbeads in products and the more general desire for environmentally conscious consumption are high, this interest is unlikely to be a direct result of the ban itself. Three environmental NGOs who responded to our surveys indicated that they believed public awareness of microbeads had increased as a result of the ban, although there were differing views as to whether or not it helped increase public awareness of the broader topic of plastic pollution. Nonetheless, social research into public perceptions of microplastics, conducted around the time that plans for a ban were announced (2016-17), found that some participants cited their sources of information about microbeads as news media reports relating to their regulation. This indicates that the debate around regulating microbeads, including the Environmental Audit Committee hearing and the announcement of the ban, may have raised public awareness and understanding of the issue in some cases⁸. Concern was expressed by one environmental NGO that some members of the public may perceive that the ban covers all cosmetic and personal care products rather than just rinse-off products. Some news articles⁹ do not reflect that the scope of the ban covers rinse-off cosmetics and personal care products only. A Defra news story about the

⁵ I. Bailey. (2022) Media coverage, attention cycles and the governance of plastics pollution. *Environmental Policy and Governance* 32 (5) pp 377-289 DOI: <https://doi.org/10.1002/eet.1977>

⁶ Ditching microbeads: the search for sustainable skincare. Guardian Sustainable Business. Access at: <https://www.theguardian.com/sustainable-business/microbeads-cosmetics-gyres-plastics-pollution-makeup>

⁷ 64% of consumers find it 'difficult' to buy sustainable beauty products. Access at: https://cosmeticsbusiness.com/news/article_page/64_of_consumers_find_it_difficult_to_buy_sustainable_beauty_products/177154

⁸ L. Henderson and C. Green (2020) Making sense of microplastics? Public understandings of plastic pollution. *Marine Pollution Bulletin* 152. 110908. DOI: <https://doi.org/10.1016/j.marpolbul.2020.110908>

⁹ Plastic microbeads ban enters force in UK. The Guardian. Access at: <https://www.theguardian.com/environment/2018/jan/09/plastic-microbeads-ban-enters-force-in-uk>

announcement of the ban reflects on microbeads originating from products including face scrubs, toothpastes and shower gels¹⁰.

1.3 Support the cosmetics industry by setting a level playing field while ensuring a suitable timescale for implementation to minimise impact on the industry

Post-implementation survey responses from businesses within the cosmetics industry suggest that the timescale of the ban has been effective in minimising impact on the industry. To minimise the cost to business the ban was implemented in two stages, with microbeads being banned from the manufacture of rinse-off products on 1st January 2018 and from sale on 30th June 2018. In advance of the ban, voluntary measures to remove microbeads from products were being pursued by companies at the recommendation of Cosmetics Europe, the European trade association for cosmetics and personal care products. This recommended the discontinuation of using synthetic, solid plastic particles used for exfoliation and cleansing in wash-off cosmetic products being placed on the market by 2020. The original impact assessment noted that 72% of major cosmetics companies had stopped selling products containing microbeads by 2017, and all responses from cosmetics manufactures noted that their internal removal of microbeads happened between 2014 and 2017 (although the small sample of survey responses received does not necessarily represent the entire industry). During its hearing on the environmental impacts of microplastics the Environmental Audit Committee noted that there were inconsistencies in the voluntary approach and that some companies may not phase out at all. They stated that voluntary action alone would not be adequate and believed that a legislative ban would be beneficial in bringing greater consistency in the industry¹¹. In Australia, where the voluntary approach by industry embedded in government plastics strategy had been shown to be highly successful (99.3% of products examined were free of microbeads), state bans were still enacted to ensure that the products in scope remained microbead free.

With the ban in England coming into force in 2018, it has sped up the pace of the phase out of microbeads in rinse-off personal care products, promoting a consistent approach across the industry based on standardised definitions of “plastic” and “microplastic”. In response to our survey, the ban was commended by a UK trade association for cosmetics and personal care products describing it as creating a level playing field for all companies placing the relevant cosmetic products on the UK market through its “scientific” definitions.

¹⁰ Microbead ban announced to protect sealife. Defra. Access at: <https://www.gov.uk/government/news/microbead-ban-announced-to-protect-sealife>

¹¹ House of Commons Environmental Audit Committee (2016). Environmental impact of microplastics. Fourth Report of Session 2016–17. <https://publications.parliament.uk/pa/cm201617/cmselect/cmenvaud/179/179.pdf>

1.4 Set an example for other countries and encourage wider adoption of legislation

This post-implementation review concerns only the regulations for England. The original impact assessment stated that, although all UK administrations supported the ban, they were each required to bring in their own legislation according to their own legislative processes and timescales. All UK administrations have introduced such bans since the legislation in England has come into force.

The ban was at the time commended as one of the 'world's toughest'¹², and environmental charities noted its potential to pave the way for other legislation both in the UK and across the world. Since England's legislation has come into force, countries including New Zealand, Italy, Ireland, Thailand, Argentina, China and individual states in Australia have introduced their own legislation to tackle microbeads in personal care products as part of a wider global effort to tackle plastic pollution, particularly in the marine environment.

2. Evaluation of costs and benefits of the ban

2.1 Costs

The original impact assessment estimated an annual net cost of £0.5m over a 10-year period, made up of £0.46m for substitution to a benign alternative and £0.04m in enforcement costs. Enforcement costs are not incurred by businesses and whilst substitution costs were counted as costs to businesses in the impact assessment, it was deemed likely that the burden would fall on consumers through increased prices. Due to a lack of monitoring following the implementation of the ban, comprehensive cost data covering the cosmetics industry in England is not available. The assessment of costs in this section is therefore based largely on anecdotal evidence from survey responses. The table below sets out the cost assumptions from the impact assessment and the available evidence supporting or challenging them (where no cost was assumed in the impact assessment, 'no evidence of cost' provides support for the assumption).

¹² New UK microbead ban one of world's toughest. CNN. Access at: <https://edition.cnn.com/2018/01/09/health/microbead-ban-uk-intl/index.html>

Cost category	Assumption in impact assessment	Evidence since ban implemented														
Reformulation and relabelling	No cost, as part of business-as-usual process of updating products	<p>Some initial cost associated with the introduction of natural alternatives. One respondent provided a total average cost estimate of €165,004 (~£145,000)¹³ for the European cosmetics industry for reformulating one formula with the following breakdown:</p> <table border="1" data-bbox="900 757 1321 1370"> <thead> <tr> <th data-bbox="900 757 1147 842">Cost area</th> <th data-bbox="1147 757 1321 842">% of total</th> </tr> </thead> <tbody> <tr> <td data-bbox="900 842 1147 925">R&D</td> <td data-bbox="1147 842 1321 925">35.9%</td> </tr> <tr> <td data-bbox="900 925 1147 1008">Redesign</td> <td data-bbox="1147 925 1321 1008">11.2%</td> </tr> <tr> <td data-bbox="900 1008 1147 1090">Testing</td> <td data-bbox="1147 1008 1321 1090">14.6%</td> </tr> <tr> <td data-bbox="900 1090 1147 1205">Regulatory compliance</td> <td data-bbox="1147 1090 1321 1205">13.5%</td> </tr> <tr> <td data-bbox="900 1205 1147 1288">Manufacturing</td> <td data-bbox="1147 1205 1321 1288">14.5%</td> </tr> <tr> <td data-bbox="900 1288 1147 1370">Other</td> <td data-bbox="1147 1288 1321 1370">10.3%</td> </tr> </tbody> </table> <p>Another survey response reported reformulation costs associated with safety assessments, artwork origination and additional safety testing. Importantly, the reformulation costs for larger firms may be shared internationally – one response stated that regulations in other global markets triggered their product reformulation.</p>	Cost area	% of total	R&D	35.9%	Redesign	11.2%	Testing	14.6%	Regulatory compliance	13.5%	Manufacturing	14.5%	Other	10.3%
Cost area	% of total															
R&D	35.9%															
Redesign	11.2%															
Testing	14.6%															
Regulatory compliance	13.5%															
Manufacturing	14.5%															
Other	10.3%															

¹³ Currency conversion based on spot rate recorded on 23 Feb 2023.

Cost of substituting for alternative	Costs are likely to be passed on to consumers through increased prices	<p>No concern raised in responses from cosmetics companies about increased costs from substitution, however one noted that reformulation costs still exist even when alternatives to plastic microbeads were readily available. Most responses suggest that consumer prices also did not increase, suggesting that costs were overestimated in the original impact assessment.</p> <p>However, one respondent noted an increase in price when substituting plastic (£2.50/kg) for a rice starch-based material and a silica-based material (£5.50/kg to £15.50/kg). They also reported that both their costs and consumer prices had slightly increased as a result of the ban, suggesting that increased costs are partially passed on to consumers.</p>
Capital costs	No investment in new machinery expected	No evidence of cost
Shelf life	No cost. Natural alternatives have a shorter shelf life than microbeads, but products aren't expected to remain on shelves for this long.	No evidence of cost
Supply stability	No cost, cosmetics ingredient suppliers typically supply both plastic microbeads and their substitutes	No evidence of cost
Demand effects	No cost. Products containing microbeads likely to be cheaper as they are aimed at the mass market, but ethical concerns may reduce demand for them,	Most company responses indicated no change in sales or consumer prices. One company noted a slight increase in consumer prices but did not report any impact on sales.

	so effects are expected to cancel out.	
Enforcement effects	Costs do not fall on businesses, as trading standards authorities are expected to enforce the ban (they currently enforce Regulation (EC) No 1223/2009 on cosmetics products ingredients)	Costs do not fall on businesses. Local Authority Trading Standards did not actively enforce the ban; thus it is likely that enforcement costs are limited.
Trade effects	No cost. Bans in EU and North America are also being considered, but most companies operating globally voluntarily removed microbeads from rinse-off products in all markets prior to the ban.	No evidence of cost

The impact assessment based its substitution cost estimates on the uptake of silica as an alternative to plastic microbeads as it is the cheapest suitable alternative. Whilst some cosmetics companies did report switching to silica as an alternative, others began using other natural alternatives such as walnut shells, jojoba beads, corn kernels, bamboo particles, hydrated silica and rice powder. Natural alternatives were originally not considered to be a direct substitute for microbeads due to being considerably more expensive than microbeads (up to £60 per kilo, compared to around £5 per kilo for microbeads). Whilst the use of natural alternatives as a substitute could indicate that initial cost estimates in the impact assessment were underestimated, most companies switching to natural alternatives did not report any large increases in costs or noticeable impacts on sales resulting from the ban. One company reported a slight increase in both business costs and consumer prices but did not estimate any impact on sales, (although they noted that any products that could not be reformulated would have been dropped from their range). Additionally, one company reported an increase in costs for using natural alternatives to £5.50/kg to £15.50/kg (up from £2.50/kg for plastics), which, given the original assumptions of indicative product microbead content (3% for toothpaste, 5% for face scrubs), the unit cost of switching is relatively low – the reported costs would represent an additional cost between £0.01 and £0.16 per unit. This suggests that the cost of using natural alternatives in the original impact assessment may have been overestimated. Furthermore, some companies may have opted to use higher-cost natural alternatives to differentiate their products from others on the market. Multiple respondents cited that they used, for example, jojoba wax as an alternative, which

costs around £24.80/kg¹⁴ - around five times more than polyethylene beads. One respondent also reported that they did not seek any substitute, instead opting to remove microbeads of any material from their products.

This is an important consideration for potential future legislation, as costs for alternatives (and therefore overall costs to businesses) may be lower than previously expected. Reasons given by companies for switching to natural alternatives including silica were performance, cost, availability and consumer confidence in the environmental impact of products.

It is worth noting that the ban was not considered to have driven innovation of alternatives as members of the cosmetics industry were taking voluntary action and conducting reformulation since 2012. As such innovation in alternatives had already occurring in advance of the ban being announced and were available for those who were yet to reformulate. One respondent suggested that regulatory changes in a range of countries led to the reformulation of rinse-off products available in the UK market, indicating that the UK ban on microbeads was not the only trigger for innovation and reformulation. Reformulation costs were not included in the original impact assessment on the assumptions that voluntary action was already driving the removal of microbeads industry-wide, that reformulation and relabelling were routine processes that occurred periodically in the industry, and that some manufacturers were able to phase out microbeads at no extra cost. One respondent did report reformulation and relabelling costs in the post-implementation survey, however these were reported for the European market as a whole – this could indicate that these would have been incurred regardless of the UK ban, as regulations in the European market surrounding microbeads had also changed. It is also likely that the cited cost figure represents the total for Europe, rather than for the UK – the exact cost for the UK side of manufacture would be difficult to isolate, but likely to be substantially less than the reported €165,004 (~£145,000) figure. There is a lack of data available on the specific impacts of the ban on small-medium enterprises in England, including in evidence available from the trade associations.

The voluntary removal of plastic microbeads from manufacturing and sale by cosmetics companies prior to the implementation of the ban was, as mentioned, factored into original cost assessments, which increases the likelihood that cost estimates are accurate. The estimates of costs to business for the implementation of the ban likely represent the high end of costs from substituting to an alternative, as products affected by the ban were likely to be those manufactured at very low cost.

Further evidence to show that the ban had little to no impact on costs comes from two retailers responding to the post-implementation survey. They reported there were no changes to consumer prices that could be attributed to the ban. This shows that if there were

¹⁴ Hunt, C.F., Lin, W.H. & Voulvoulis, N. "Evaluating alternatives to plastic microbeads in cosmetics." *Nat Sustain* 4, 366–372 (2021). DOI: <https://doi.org/10.1038/s41893-020-00651-w>

any increases in production costs, they were not passed onto consumers, and would have instead been absorbed by businesses. The same respondents also reported no significant change to sales, indicating that consumer behaviour did not change following the ban in the experience of the two respondents. If manufacturers faced significantly higher costs, we would usually expect some of the costs to be passed onto consumers through higher product prices – the fact that this did not happen suggests that some retailers were able to phase out plastic microbeads at very little cost.

Regarding the projected enforcement costs, these were overestimated since Trading Standards takes an intelligence-based approach and has received no complaints about products in relation to this ban to our knowledge (see *Section 3.2* on monitoring and enforcement). The original impact assessment estimated enforcement costs would sum to £0.04m over the appraisal period, however due to the approach taken by Trading Standards, the actual costs are likely to be negligible.

2.2 Benefits

The benefits of the ban were not quantified in the original impact assessment but are assumed to be at least as high as the modest costs of the measure. The benefits fall into two categories: benefits to businesses and environmental benefit. Benefits to businesses were suggested to include increased demand and higher profit margins for some products, driven by consumer perceptions that cosmetic products no longer cause damage to the marine environment. However, it is unlikely that this benefit would have been realised because all rinse-off products are subject to the ban, meaning that no substitutable rinse-off product would be perceived as less damaging than another. Another positive effect of the ban was identified through its potential to set an example for other markets and increasing their likelihood of implementing similar bans (because the ocean is a common resource and marine litter is a transboundary problem). This is reducing a source of microplastics to the environment.

It has been well documented that the presence of microplastics can cause a range of detrimental effects. A recent review by Sangkam *et al.*,¹⁵ summarised research which found detrimental cellular, biochemical, immune and reproductive system level effects caused by the presence of microplastics. Research specifically on microbeads has found their presence to cause declines in plant growth¹⁶ and increased malformation and mortality in

¹⁵ S. Sangkham, O. et al., 2022. A review on microplastics and nanoplastics in the environment: Their occurrence, exposure routes, toxic studies, and potential effects on human health, *Marine Pollution Bulletin*, 181, 113832, ISSN 0025-326X. DOI: <https://doi.org/10.1016/j.marpolbul.2022.113832>.

¹⁶ Urbina, M.A. et al., 2020. Adsorption of polyethylene microbeads and physiological effects on hydroponic maize. *Science of The Total Environment*. 741, 140216. DOI: <https://doi.org/10.1016/j.scitotenv.2020.140216>

fish¹⁷. The ban removes one source of microplastics that could be otherwise released to the environment.

3. Potential next steps

3.1 Is the regulation still required?

A recent policy scenario analysis from the OECD indicates that policies, including bans and restrictions, that specifically mitigate the leakage of microplastics are an important part of a coordinated, global policy mix for ensuring effective mitigation of microplastic pollution¹⁸. There has been no scientific evidence to change our opinion on the potential damage microplastics can have in the environment¹⁹, therefore there is a need for the ban to remain in place to keep this source of microplastics off the market in England, mitigating any risk of their reintroduction. Although an estimated 72% of businesses took voluntary action to remove microbeads prior to the ban, others were continuing to use them in their products. The original impact assessment presented a best estimate that without the ban being implemented, 1% of toothpaste and 8% of face care products domestically would continue to contain microbeads, as well as 1% of total imported products. This legislation now means the industry is legally obliged not to buy, sell or manufacture rinse-off products containing plastic microbeads based on a standardised definition. The review has provided no reason to revoke this.

Whilst the ban has been successful in removing microbeads from rinse-off cosmetics and personal care products, environmental NGOs that we surveyed expressed concern that the ban did not cover a broader range of products containing intentionally-added microplastics. For example, intentionally-added microplastics can also be found in leave-on cosmetics, including mascara, lipsticks and sunscreens, and domestic cleaning products and have the potential to enter the environment through their use²⁰. At the time, the ban was limited to

¹⁷ De Guzman, M. C., et al., 2020. Embryotoxic and teratogenic effects of polyethylene microbeads found in facial wash products in Zebrafish (*Danio rerio*) using the Fish Embryo Acute Toxicity Test. BioRxiv. DOI: <https://doi.org/10.1101/2020.09.16.299438>

¹⁸ OECD (2023) Towards Eliminating Plastic Pollution by 2040: A Policy Scenario Analysis (Interim Findings). Access at: <https://www.oecd.org/environment/plastics/Interim-Findings-Towards-Eliminating-Plastic-Pollution-by-2040-Policy-Scenario-Analysis.pdf>

¹⁹ Marine Plastic Pollution - Evidence Review (Project ME5453 Technical Report). Defra. Access at: <https://sciencesearch.defra.gov.uk/ProjectDetails?ProjectId=20339>

²⁰ Hazardous Substances Advisory Committee. (2019). HSAC view on the risk to the marine environment of microplastic in leave-on cosmetic and domestic cleaning products. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/834893/hsac-advice-microbeads-2019.pdf

rinse-off cosmetic products due to insufficient evidence gathered at consultation to justify the higher costs to businesses likely associated with extending the ban to leave-on products in addition to rinse-off products²¹. Defra has commissioned an evidence project to assess the scale of the risks and identify the most effective measures to address intentionally added microplastics beyond the 2018 microbead ban. This research intends to improve understanding of the potential socioeconomic, environmental and human health impacts of intentionally-added microplastics in the UK. It will consider the impacts of different potential policy actions, including placing controls on emissions of intentionally added microplastics, physical and chemical mechanisms of pollution, quantity and environmental damage estimates of emissions to the environment from different sectors, estimates of costs to businesses for reformulation to use alternatives to microplastics, uncertainties around environmental damage estimations and human health costs. This project will collect and analyse data on these issues to assess potential policy responses. It would not be appropriate to revisit the scope of the ban before this research has been conducted as it will be valuable for considering potential management options. Project outputs are expected in 2025.

3.2 Monitoring and enforcement

Local Authority Trading Standards Services are the enforcement agency responsible for the enforcement of the ban since they currently enforce Regulation 2009/1223 and the Cosmetic Products Enforcement Regulations 2013: Great Britain. Trading Standards Authorities take an intelligence led approach to enforcement for all its duties. This means work will be based on complaints or other intelligence to suggest breaches, rather than routine surveillance or testing. This is due primarily to this being the most effective use of limited resources and accords with Government advice on better regulation principles. To our knowledge no product testing has been conducted. Engagement with 21 local authorities during a Trading Standards Northwest meeting found that none had conducted direct checks at premises in relation to the ban, nor had there been any public complaints. The microbeads ban, like similar legislation on carrier bags and single use plastics, was considered to not require much in the way of retail market surveillance. If the products are no longer manufactured in the UK and legitimate businesses no longer import them, as they are not legal, then their presence at retail level disappears rapidly. Unlike other products (such as tobacco or vapes) the likelihood of an illicit "black market" in such goods would be low. One retailer who responded to our post implementation survey noted that they did not know of any cases of infringement of the ban.

Survey responses from some NGOs expressed concern that a lack of monitoring and enforcement of the ban may be reducing the effectiveness of its implementation. A recent spot check of products in high street stores noted the ongoing use of polymeric ingredients

²¹ The Environmental Protection (Microbeads) (England) Regulations 2017 ([legislation.gov.uk](https://www.legislation.gov.uk))

in products affected by the ban. However, these compounds, such as Acrylates Copolymer, do not correspond to the definition of a microbead laid out in this legislation. A variety of polymers are used in cosmetics but not all are plastic²². The Royal Society for Chemistry has recently created a roadmap for sustainable polymers in liquid formulations, including calling for the development and scale up of biodegradable polymers by 2030²³. The safety of these compounds is governed by the UK Cosmetics Regulation - Schedule 34 of the Product Safety and Metrology (EU Exit) Regulations 2019.

The availability of monitoring data on microbeads in the environment in England is limited and therefore the removal of the source of microbeads in shops is considered the better indicator for measuring the effectiveness of the legislation. Based on the review of available evidence it has not been possible to quantify any reduction of microbeads in the environment. Prior to the ban, the presence of microbeads in the environment varied highly depending on location. High microbead loads were found near sewage outlets and urban areas^{24,25}, but variable amounts of microbeads were found in coastal sediments and surface waters (and in relatively lower quantities compared to upstream sampling) with fibres and fragments often a higher proportion of the microplastics found^{26,27,28}. No study was repeated, meaning it is not possible to compare environmental concentrations before and after the ban. Three academic studies that took samples shortly after the ban was in place identified

²² [CTPA calls for action on microplastics to be proportionate, meaningful and led by science \(thefactsabout.co.uk\)](https://thefactsabout.co.uk/ctpa-calls-for-action-on-microplastics-to-be-proportionate-meaningful-and-led-by-science/)

²³ <https://www.rsc.org/policy-evidence-campaigns/environmental-sustainability/sustainability-reports-surveys-and-campaigns/polymers-in-liquid-formulations-plfs/>

²⁴ Tibbetts, J., Krause, S., Lynch, I., Sambrook Smith, G. H. 2018. Abundance, Distribution, and Drivers of Microplastic Contamination in Urban River Environments. *Water*, 10, 11. DOI: <https://doi.org/10.3390/w10111597>

²⁵ Hurley R.; Woodward J.; Rothwell J.J. 2018. Microplastic contamination of river beds significantly reduced by catchment-wide flooding. *Nature Geoscience*, 11, 4. DOI: <https://doi.org/10.1038/s41561-018-0080-1>

²⁶ Green, B.C., Johnson C.L.E. 2020. Characterisation of microplastic contamination in sediment of England's inshore waters. *Marine Pollution Bulletin*, 151,110788. DOI: <https://doi.org/10.1016/j.marpolbul.2019.110788>

²⁷ Scott, N., Porter, A., Santillo, D., Simpson, H., Lloyd-Williams, S., Lewis, C. 2019. Particle characteristics of microplastics contaminating the mussel *Mytilus edulis* and their surrounding environments. *Marine Pollution Bulletin*, 146. DOI: <https://doi.org/10.1016/j.marpolbul.2019.05.041>

²⁸ Maes, T., Van der Meulen, M.D., Devriese, L.I., Leslie, H.A., Huvet, A., Frère, L., Robbens, J., Vethaak, A.D. 2017. Microplastics baseline surveys at the water surface and in sediments of the North-East Atlantic. *Frontiers of Marine Science*, 4. DOI: <https://doi.org/10.3389/fmars.2017.00135>

microbeads in very low quantities. One study conducted in 2019²⁹ after the ban came into effect found small amounts of polyethylene and polypropylene microbeads in five out of 13 English rivers from mid-stream water samples including from the Mersey. The second³⁰ found a singular bead of polymethyl acrylate in sewage sludge. The third was conducted at the same time the ban was put into place (June 2018). The study found high levels of microplastic pollution in the Scilly Islands, with very few microbeads present (microplastic fragments accounted for 93% of microplastics, fibres 5% and other including microbeads the remaining 2%)³¹. One source of monitoring data for microplastics is the Chemicals Investigation Program - a series of investigations into the occurrence, sources, and removal of chemical contaminants from the wastewater treatment works. They monitor chemical substances nationally but have only begun investigating the presence of microplastics regionally in 2020 after the ban came into force. The most recent report from the programme on microplastics in wastewater treatment works from 2020 – 2022³², found higher concentrations of microplastics in sewage influent than effluent with an estimated removal rate of 99.5% ($\pm 3.5\%$). There was a greater concentration of microplastics in sewage sludge compared to sewage effluent (an average of 557 $\mu\text{g/L}$ or 19,812 particles per litre of sludge). Microbeads specifically are not noted in the report results.

There are no available methods that can distinguish the exact origin of most microplastic found in the environment, other than to identify them to polymer type. Many products will use similar or identical beads – this would include products covered by the ban (i.e. wash off cosmetics) and those not covered (i.e. leave on cosmetics, household products, commercial products from non-domestic wastewater). Additionally, microbeads are not always uniform in shape or size. A study investigating the amount of microplastics in cosmetics products found they had a variety of shapes including fragments, ribbons,

²⁹ D. Santillo, K. Brigden, V. Pasteur, F. Nicholls, P. Morozzo, P Johnston. 2019. Plastic pollution in UK's rivers: a 'snapshot' survey of macro- and micro-plastic contamination in surface waters of 13 river systems across England, Wales, Scotland and Northern Ireland *Greenpeace Research Laboratories Technical Report*. Access at: [GRL-TR-04-2019-plastics-in-UK-rivers.pdf \(greenpeace.to\)](https://www.greenpeace.org/uk/campaigns/our-planet/our-rivers/plastic-pollution-in-uk-rivers)

³⁰ D. Harley-Nyang, F.A. Memon, N. Jones, T. Galloway. 2022. Investigation and analysis of microplastics in sewage sludge and biosolids: a case study from one wastewater treatment works in the UK. *Sci. Total Environ.*, 823, Article 153735. DOI: [http://dx.doi.org/10.1016/j.scitotenv.2022.153735](https://dx.doi.org/10.1016/j.scitotenv.2022.153735)

³¹ Nel, H. A., Sambrook Smith, G. H., Harmer, R., Sykes, R., Schneidewind, U., Lynch, I., Krause, S. 2020. Citizen science reveals microplastic hotspots within tidal estuaries and the remote Scilly Islands, United Kingdom. *Marine Pollution Bulletin*. 161, B. DOI: <https://doi.org/10.1016/j.marpolbul.2020.111776>

³² UKWIR, 2022, 22/EQ/01/23 – The National Chemical Investigations Programme 2020-2022, Volume 2, Investigations into The Fate and Behaviour of Microplastics Within Wastewater Treatment Works. Prepared by UK Centre for Ecology & Hydrology.

threads, ellipses and spheres³³. For this reason, it is not possible to distinguish whether microplastics in the environment originate from products covered by the ban from those that are not³⁴. It is also possible that microbeads found in the environment after the ban could be a legacy of microbead-containing products covered by but purchased before the ban, which were used after the ban had come into force. If this is the case, then it is anticipated that emissions from legacy products will have reduced over time.

4. Conclusion

A post-implementation review of this legislation suggests that the ban has been successful in removing microbeads from rinse-off cosmetics and personal care products and remains necessary to keep these off the market in England – mitigating any risk of their reintroduction. As research is continuing into the risks associated with intentionally-added microplastics in a broader range of products and the most effective measures to address them it would be premature at this point in time to reconsider the scope of the ban. It is therefore our recommendation to keep the legislation. There has been no change in our scientific understanding of microbeads and the harm they could cause to the natural environment. Most of the businesses and NGOs we surveyed indicated that the ban within this legislation met their expectations. Whilst there was scope for more proactive engagement of manufacturers and retailers ahead of the introduction of the ban, the ban has set a level playing field with standardised definitions to force action from companies who had not voluntarily removed microbeads from their products. We have no evidence of legal challenges to the ban or infringements.

³³ Napper, I.E., Bakir, A., Rowland, S.J., Thompson, R.C. 2015. Characterisation, quantity and sorptive properties of microplastics extracted from cosmetics, Marine Pollution Bulletin, Volume 99, Issues 1–2. DOI: <https://doi.org/10.1016/j.marpolbul.2015.07.029>.

³⁴ Hazardous Substances Advisory Committee. (2019). HSAC view on the risk to the marine environment of microplastic in leave-on cosmetic and domestic cleaning products. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/834893/hsac-advice-microbeads-2019.pdf

E03129892

978-1-5286-4914-8