CIWEM Chartered Institution of Water and Environmental Management

Consultation Response
February 2017

Defra
Proposals to ban the use of plastic microbeads in cosmetics and personal care products in the UK and call for evidence on other sources of microplastics entering the marine environment

Proposals for a ban

CIWEM supports the proposals for a ban. Although the occurrence of microbeads used in personal care products such as face scrubs, toothpastes and shower gels are a minor contributor to the overall problem, this is an easy win as the microplastics can easily be replaced with far less damaging alternatives.

CIWEM considers urgent measures are needed to address both primary and secondary microplastic pollution as once released into the environment there is no prospect of any practicable means by which these pollutants can be removed.

The presence of microplastics on land and in rivers, lakes, groundwater and the ocean is influenced by a combination of environmental factors including exposure to UV radiation, buoyancy and by the properties of the polymer from which they are made. Routes by which primary and secondary microplastics enter the aquatic environment include dumping, litter, commercial and domestic discharges to sewer, runoff into rivers, runoff into combined sewer systems and runoff directly into lakes and oceans. The proposed ban only tackles a small proportion of primary microplastics released through specific routes. As research is undertaken and knowledge grows, further action should be taken in these areas where it would limit plastic pollution.

On the introduction of the ban, measures should also be taken to avoid redefinition of the plastic beads used in personal care products so that manufacturers avoid looking for alternatives.

Further sources of potential marine microplastic pollution including larger marine plastic debris that breaks down into microplastics, such as plastic bottles and other packaging

Key sources of microplastics are set out in Part 3: Background. Are any missing or inappropriate? Please provide evidence to support your response.

Microplastics are categorised as primary or secondary:

- Primary microplastics include industrial scrubbers used in blast cleaning, plastic powders used in moulding, plastic nanoparticles used in a variety of industrial processes and micro-beads in cosmetic formulations. Soaps are a major source both in personal care products and in detergents for washing machines.

- Secondary microplastics are formed by the fragmentation and weathering of larger plastic items during the use of products such as textiles, paint and tyres, or once these or other plastic items (bags, bottles etc.) have been released into the environment.

The plastic waste problem is growing rapidly in developing countries, partly due to increased affordability of products made from plastic and partly due to vastly inadequate infrastructure to manage the waste problem.

b. Which sources of microplastic pose the greatest risks to the marine environment? Please provide evidence to support your response.

Many microplastic particles are found suspended in the water, where they can enter the food chain through ingestion by filter feeders, ranging from zoo plankton to baleen whales or ingested by benthic species where particles sink to the bottom. Although most research has focused on marine environments, freshwater systems may be at greater risk being typically smaller and closer to point sources.

Data on the biological effects of microplastics in freshwater species is completely lacking. The accumulation of other freshwater contaminants on microplastics is of special interest because ingestion might increase the chemical exposure. Data is unavailable on this important issue.

The adverse environmental effects of the polymers and additives which make up the microplastics are not fully known. Organisms that ingest microplastics particles lack a digestive system that can degrade them. Fibres can, however, clump and knot blocking the digestive tract of small organisms in a similar way that larger plastics do in larger organisms. Also the nutrition of small organisms is potentially undermined if they mistake plastics for food.

The toxic or hormonal disruptive effects of microplastics are attributed by UNEP to persistent organic pollutants (POPs) that may be used as additives in plastic manufacture and to the ability of microplastic particles to attract and concentrate harmful organic pollutants with which they come into contact. Additives used in manufacture include, polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), perfluorooctanoic acid (PFOA), bis-phenol A (BPA) and phthalate plasticisers. Microplastics could also provide a medium for exotic species and pathogens, for example microorganisms developing biofilms on microplastics particles.

The proportions of different microplastics in sewage and run off differs substantially from those in the oceans as there has generally been less opportunity for the breakdown of larger plastic fragments into secondary microplastics. Removal of microplastics by conventional primary and secondary wastewater treatment technologies, although very high overall,[i] is highly dependent on the density and size of particle[ii].

Primary microplastics are not captured by the screens at wastewater treatment works and are therefore discharged from the works into surface water as part of effluent discharge. Where they are trapped in the organic biomass they would end up in the sludge. Most of the microplastics in the oceans are from both sewage and effluent discharge to surface water, indirectly to the marine environment and directly as part of sea outfalls.

That which is removed becomes concentrated in sewage sludge and can create its own problems. If spread to land, microplastics may eventually be, in part, returned to the aquatic environment. The possible negative environmental impact associated with the application of sewage sludge containing microplastics to farmland has not been extensively researched.

Microplastics degrade slowly and as a result can accumulate in the soil. Their decomposition in soil may release POPs present in the microplastics, and thereby enter the human food chain via the crops. POPs have been shown to be taken up by plants, but at a lower rate than heavy metals for example.

c. How should sources be prioritised for action? Please explain your response.

Data is lacking on the impacts of different microplastics. Establishing baseline data on which are the most damaging and under what conditions will require a collaborative effort by environmental scientists from diverse disciplines. CIWEM proposes a review of existing research as well as additional new research into:

1. The pathways by which microplastics leach into the environment.
2. The decomposition and fragmentation of plastics in the environment.
3. Environmental impacts: including the toxicity/ hormonal disruptive effects and breakdown of persistent organic pollutants (POPs) present in plastics and the ability of specific microplastics to concentrate pollutants in the water with which they come into contact, the biological effects of microplastics in freshwater species and accumulation in freshwater environments.
4. Treatment: The efficacy of water treatment processes in removing microplastics and the consequences of microplastics being ingested in drinking water. As many water treatment processes already have substantial capabilities for removing protozoa this requires a focus on very small microplastic fragments in particular those of less than 5µm. Microplastic removal in domestic appliances such as washing machines and in wastewater treatment, their concentration in sludge and the consequences of applying that sludge to land.

d. What possible interventions could be developed to reduce these risks and how might the cost of these interventions be minimised? What is the likely impact on industry of these interventions? Please explain your response

Initiatives to date, whilst welcome, fall far short of what is needed to bring the problem of microplastics under control. Governments, international bodies, universities, plastics manufacturers, consumers and companies using plastics in their products all need to play their part.

Once the risks have been identified then the government can use interventions such as incentives (financial or otherwise) for the use of viable plastics or plastic alternatives that are shown to be less damaging and discourage the use of specific additives and polymers shown to be particularly damaging. This could be financial or could be a ban on the use of specific plastics for specific applications.

To reduce secondary microplastics improved recovery and recycling of plastics is needed to minimise the quantity that reaches the environment. Charging for bags to reduce consumption has been highly successful in the UK with around 80 per cent fewer single use bags being taken home from supermarkets. The UK should look for other options to deliver a high standard of recovery and recycling at home and also target assistance to less developed counties to alleviate what in many parts of the world is an immense problem. Around three billion people do not have waste collection and disposal services.

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[i] Magnusson K & Norén F IVL Swedish Environmental Research Institute: Screening of microplastic particles in and down-stream a wastewater treatment plant, 2014, Number C55

[ii] Carr, S. A.; Liu, J.; Tesoro, A. G. Transport and fate of microplastic particles in wastewater treatment plants. Water Res. 2016, 91, 174−182