Cynulliad Cenedlaethol Cymru | National Assembly for Wales
Y Pwyllgor Newid Hinsawdd, Amgylchedd a Materion Gwledig | Climate Change, Environment and Rural Affairs Committee
Ymchwiliad Microblastigau | Microplastic Inquiry

Ymateb gan : Cymdeithas Cadwraeth Forol
Evidence from : Marine Conservation Society

Thank you for giving the Marine Conservation Society (MCS) the opportunity to provide evidence to the CCERA Committeeôs inquiry on the impact of microplastic pollution in Welsh waterways. Please find our response to each question below:

1. **To what extent are microplastics, including synthetic microfibers, a problem within Wales' aquatic environment? How does this impact on environmental and human health?**

Introduction

Plastic use and production in the UK are set to rise. It has been estimated that current (2018) waste arising are estimated at 5.2 million tonnes, and are forecast to increase to around 6.3 million tonnes by 2030 ï a 20% increase over this 12 year period[1].

Plastics have been found in all environments from remote Swiss high mountain areas[2] to the ocean trenches[3] and Antarctic ice[4] . Traces of microplastics have also been found in bottled[5] and tap water[6], beer[7], honey[8] and even the air we breathe[9].

It is important to note that macroplastics (larger plastic items) are also having a devastating effect on our aquatic environment: they contribute to the entanglement, starvation and smothering of marine and freshwater organisms. Macroplastics are also a key source of microplastic pollution once larger plastic pieces break down. Our written evidence will also therefore include impacts and solutions to the problem of macroplastic pollution.

[1] Eunomia (2018) A plastic future: Plastics Consumption and waste management in the UK (report for WWF)

[2] Scheurer, M. and Bigalke, M., 2018. Microplastics in Swiss Floodplain Soils', Environmental Science & Technology *52* (6), 3591-3598, available at: https://pubs.acs.org/action/showCitFormats?doi=10.1021%2Facs.est.7b06003

[3] Obbard, R., Sadri, S., Wong, Y., Khitun, A., Baker, I. & Thompson, R. 2014. Global warming releases microplastic legacy frozen in Arctic Sea ice. Earth's Future, 2, 315–320; Chiba et al., 2018. Human footprint in the abyss: 30 year records of deep sea plastic debris. Marine Policy, available online

[4] Greenpeace (2018) Microplastics and persistent fluorinated chemicals in the Antarctic https://storage.googleapis.com/p4-production-content/international/wp-content/uploads/2018/06/4f99ea57-microplastic-antarctic-report-final.pdf

[5] S.A. Mason, V. Welch, J. Neratko, (2018). *Synthetic polymer contamination in bottled water*. Department of Geology and Environmental Sciences, Fredonia University, New York. Available at: http://news.bbc.co.uk/1/shared/bsp/hi/pdfs/14_03_13_finalbottled.pd

[6] Dauvergne, Peter (2018). *Why is the global governance of plastic failing the oceans?*. Global Environmental Change, 51, pp. 22-31.

[7] https://www.researchgate.net/publication/324471152_Anthropogenic_contamination_of_tap_water_beer_and_sea_salt

[8] https://www.tandfonline.com/doi/abs/10.1080/19440049.2013.843025

[9] Johnny Gasperi, Stephanie L. Wright, Rachid Dris, France Collard, Corinne Mandin, Mohamed Guerrouache, Valérie Langlois, Frank J. Kelly, Bruno Tassin (February 2018). *Microplastics in air: Are we breathing it in?*. Current Opinion in Environmental Science & Health, Volume 1, , Pages 1-5, ISSN 2468-5844. Available at: https://doi.org/10.1016/j.coesh.2017.10.002.

It is vital that we reduce our use and dependence on plastics and that we stop the flow of plastics to our rivers, seas and oceans, if we are to have any chance of turning the tide on this form of pollution.

Microplastics definition

ñMicroplasticsòare defined as plastic particles less than 5mm in size in any one dimension. There are 2 main types of microplastics:

1. Primary microplastics - these are purposefully manufactured small bits of plastics added to items such as ñmicrobeadsò, which, up until recently, were commonly used as ingredients in personal care products. These are also still to be found in cosmetics, industrial and household cleaners and industrial air blasting media. Pre-production pellets, the órawmaterialôof many plastic items, are also a significant source of primary microplastics.

2. Secondary microplastics ï these arise from the breakdown of larger plastic items on land or at sea. These include obvious sources such as polystyrene trays or plastic bottles that may take many years to break down in the aquatic and marine environment, and less obvious sources such as fibres from washing clothes, tyre wear and tear, road paint abrasion and the spreading of sewage sludge containing microplastics onto land.

Within our response to this call for evidence, we address the problems and solutions of both primary and secondary microplastics.

The extent to which microplastics are a problem

In our joint eNGO briefing on microbeads, March 2016, MCS, along with the Environmental Investigation Agency, Greenpeace and Flora and Fauna International, highlighted the reasons why microplastics are a serious concern:

- They are eaten by aquatic life at all stages of the food chain, from plankton through to fish and marine mammals, including species important to fisheries and ecosystem function[10] (the following video visually demonstrates plankton ingesting microplastics)
- The transfer of microplastics up the food chain has been demonstrated[11] [12]
- They release toxic chemicals into the surrounding water, and also attract chemicals onto their surface, which can have toxic impacts on living organisms[13] [14]

[10] Galloway, T. & Lewis, C. 2016 (and references therein). Marine microplastics spell big problems for future 1 generations. PNAS, 113, 2331-2333.
[11] Setälä, O., Fleming-Lehtinen, V., & Lehtiniemi, M. (2014). Ingestion and transfer of microplastics in the plankton 2 food web. Environmental Pollution, 185, 77-83.
[12] Farrell, P., & Nelson, K. (2013). Trophic level transfer of microplastic: Mytilus edulis (L.) to Carcinus maenas (L.). 3 Environmental pollution,177, 1-3.
[13] Browne, M. A., Niven, S. J., Galloway, T. S., Rowland, S. J., & Thompson, R. C. (2013). Microplastic moves 4 pollutants and additives to worms, reducing functions linked to health and biodiversity. Current Biology, 23(23), 2388-2392.
[14] Nobre, C. R., Santana, M. F. M., Maluf, A., Cortez, F. S., Cesar, A., Pereira, C. D. S., & Turra, A. (2015). Assessment 5 of microplastic toxicity to embryonic development of the sea urchin Lytechinus variegatus (Echinodermata: Echinoidea). Marine pollution bulletin, 92(1), 99-104.

- They persist in the environment for hundreds of years;
- They have been found in every ocean and in all marine habitats;
- Once released into the marine environment, it is impossible to clean them up.

Microplastics are now ubiquitous throughout the worldôs oceans ï at the sea surface, in the water column, in sediments and even concentrated in Arctic Sea ice. Between 15 and 51 trillion tiny plastic particles are estimated to be floating in the worldôs oceans.[15]

Impacts on Environmental Health

Ingestion and entanglement

Market surveys of fish being sold for consumption in the U.S. found plastic in 67% of all species and 25% of individual fish.[16] The impacts of plastic ingestion (both macro and microplastics) include gut blockage and physical injury, oxidative stress, altered feeding behaviour and reduced energy allocation, resulting in impacts on growth and reproduction in a range of marine invertebrates, including crabs, lugworms and oysters.[17]

In the UK, 83% of Norway lobster (typically sold as scampi) has been found to contain plastics[18] and plankton sampling demonstrates a significant increase in the abundance of plastics from the 1960s to the present day.[19] [20] Scientists estimate that European seafood consumers could be consuming up to 11,000 microplastics per year.[21]

There is also compelling evidence to suggest that macroplastic ingestion effects significant levels of marine wildlife: Gall & Thompson (2015) reported that all species of sea turtles, 54% of marine mammals and 56% of all sea birds have been affected by entanglement in, or ingestion of, marine debris, 92% with plastic. Additionally 17% of species affected were listed as between threated to critically endangered on the IUCN red list[22].

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[15] Van Sebille, E., Wilcox, C., Lebreton, L., Maximenko, N., Hardesty, B., Franeker, J., Eriksen, M., Siegel, D., Galgani, F. & Law, K. 2015. A global inventory of small floating plastic debris. Environ. Res. Lett. 10, 124006.

[16] Rochman, C. Tahir, A., Williams, S., Baxa, D., Lam, R., Miller, J., The, F., Werolorilangi, S. & The, S. 2015. Anthropogenic debris in seafood: Plastic debris and fibers from textiles in fish and bivalves sold for human consumption. Scientific Reports, 5, 14340

[17] Sussarellu R, et al. (2016) Oyster reproduction is affected by exposure to polystyrene microplastics. Proc Natl Acad 14 Sci USA 113:2430–2435; Watts AJR, Urbina MA, Corr S, Lewis C, Galloway TS (2015) Ingestion of Plastic Microfibers by the Crab Carcinus maenas and Its Effect on Food Consumption and Energy Balance. Environ Sci Technol 49(24):14597–14604; Wright SL, Rowe D, Thompson RC, Galloway TS (2013) Microplastic ingestion decreases energy reserves in marine worms. Curr Biol 23(23):R1031–R1033; Cole M, Lindeque P, Fileman E, Halsband C, Galloway TS (2015) The impact of polystyrene microplastics on feeding, function and fecundity in the marine copepod Calanus helgolandicus. Environ Sci Technol 49(2):1130–1137.

[18] Murray, F. & Cowie, P. 2011. Plastic contamination in the decapod crustacean Nethrops norvegicus. Marine Pollution Bulletin. 67(1-2): 200-202.

[19] Thompson, R.C., Olsen Y., Mitchell, R.P., Davis, A., Rowland, S.J., John, A.W.G., McGonigle, D. & Russell AE (2004) Lost at sea: Where does all the plastic go? Science 304: 838.

[20] Thompson, R. and Hoare, C. (1997). Microscopic plastic - A shore thing. Marine Conservation 3 (11)

[21] Van Cauwenberghe, L., Janssen, C. (2014) Microplastics in bivalves cultured for human consumption. Environmental Pollution. V. 193, 65–70

[22]Gall, S.C. and Thompson R.C. (2015) The impact of debris on marine life. Marine Pollution Bulletin 92 (2015) 170–179

Concentrating toxic compounds

Toxic compounds such as plasticisers, fire retardants and other additives are incorporated into microplastics during production.[23] Microplastics can also attract persistent, bioaccumulative and toxic pollutants from seawater such as the endocrine disruptors Polychlorinated Biphenyls (PCBs) and Dichlorodiphenyldichloroethylene (DDEs).[24] Microplastics can concentrate PCBs and DDEs to levels up to a million times greater than in the surrounding seawater.[25]

PCBs are linked to reproductive toxicity and population declines in marine mammal populations, and their biomagnification in marine food webs continues to cause severe impacts in top predators in European seas.[26] [27] Whilst the extent to which these contaminants are transferred from ingested plastics into living tissues is as yet unknown, there is evidence that PCBs found in the flesh of Great Shearwaters were derived from ingested plastic particles.[28]

Impacts on Human Health

With microplastics and their associated contaminants readily ingested by organisms throughout the food chain, and well documented in a range of species consumed as seafood, there is a potential danger that these pollutants may be passed up the food chain to human consumers.

As previously mentioned, scientists estimate that European seafood consumers could be consuming up to 11,000 microplastics per year. However this is an area of ongoing research and more is needed to assess the extent of ingestion of microplastics through fish and shellfish. The World Health organisation is currently looking into the possible risks of microplastics in bottled water[29].

2. What are the main sources of microplastic pollution, including microfibres?

The recent OSPAR report gives an indication of the relative proportions of several of the main types of microplastic (figure 1 below)[30].

[23] Mato Y (2001).Plastic resin pellets as a transport medium for toxic chemicals in the marine environment. Environmental Science and Technology 35 (2): 318-324

[24] Takada H, Mato Y, Endo S, Yamashita R, Zakaria M (2006). Pellet Watch: Global monitoring of persistent organic pollutants using beached plastic resin pellets.

[25] Ananthaswamy, A. (2000). Junk Food - a diet of plastic pellets plays havoc with animals' immunity. New Scientist, 20/01/01.

[26] Jepson, P., Deaville, R. et al., (2016). PCB pollution continues to impact populations of orcas and other dolphins in European waters. Scientific Reports 6, 18573.

[27] Fossi, M., Marsili, L., Baini, M., Gianetti, M., Coppola, D., Guerranti, C., Caliani, I., Minutoli, R., Lauriano, G., Finoia, M., Rubegni, F., Panigada, S., Berube, M., Ramirez, U. & Panti, C. (2016). Fin whales and microplastics: The Mediterranean Sea and the Sea of Cortez scenarios. Environmental Pollution, 209: 68-78

[28] Ryan, P.G., Connell, A.D., Gardener, B.D. (1988). Plastic ingestion and PCBs in seabirds: is there a relationship? Marine Pollution Bulletin 19(4): 174-176.

[29] https://www.theguardian.com/environment/2018/mar/15/microplastics-found-in-more-than-90-of-bottled-water-study-says

[30] OSPAR commission (2017) Assessment document of land-based inputs of microplastics in the marine environment

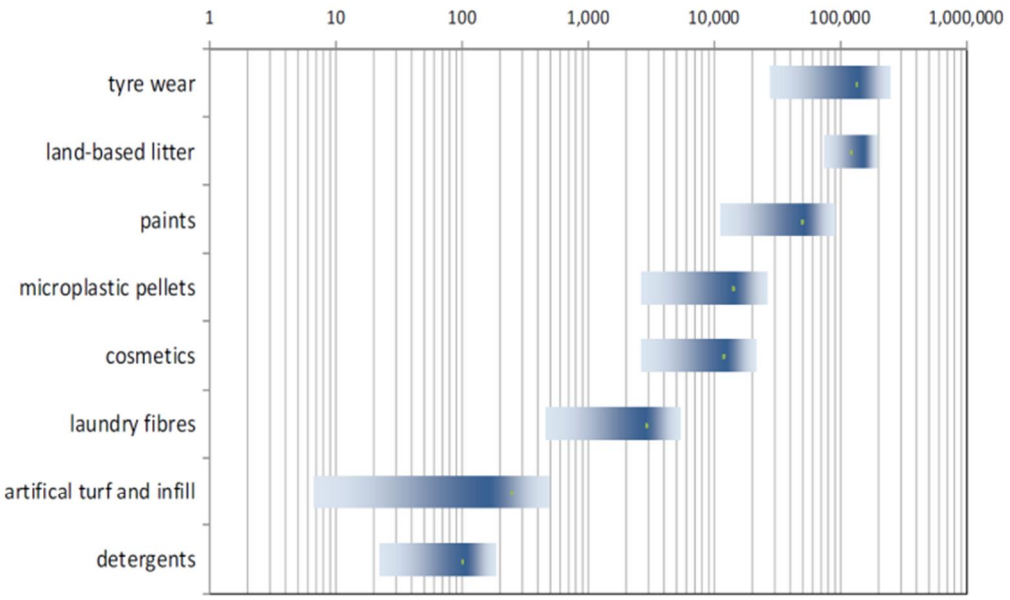

Figure 1: Estimated emissions of microplastics in OSPAR catchments (tonnes / year). The bars represent the uncertainty margins of the emission, white dots represent the midpoint.

The above figure indicates that it is likely that land-based macroplastics (litter) is the cause of some of the highest emissions of microplastics in OSPAR countries. Notable also is the higher level of certainty assigned to the amount of emissions from land-based litter source of microplastics compared to others, suggesting there is a greater body of evidence to equate microplastics to the breakdown of larger plastic items. The following information seeks to summarise some of the key sources of primary and secondary microplastic pollution:

Primary microplastics

Pre-production plastic ópelletsô

Although mostly referred to as pellets, these actually come in the form of pellets, flakes and powders all <5mm. A recent Eunomia report demonstrated that pre-production pellet loss to the environment in the UK is likely to be at least 105 tonnes, and possibly as high as 1,054 tonnes each year. These tonnages equate to 5 billion and 53 billion pellets per annum respectively.[31]

Pellets can be lost at any point in the plastics supply chain: producers, distributers, storage points, ports, transport over sea, and during waste management and recycling. Pellets are lost when spills are not completely cleaned up. These pellets can be washed into drains or directly into waterways by surface water runoff if spills occur outside. Spillages of containers at sea also contribute to microplastics in the marine environment. The Eunomia study highlights that some of the key points for pellet loss to take place are loading bays, storage for use and storage for disposal. The greatest risk is from spills from bags and boxes during handling and transportation.

[31] Sherrington, C. (2016). Study to Quantify Pellet Emissions in the UK, Eunomia Report to Fidra

Microbeads

Although there is a ban on the use and sale of some personal care products containing microbeads across the UK they are still found in some cosmetics, industrial and household cleaning products and air blasting media. In Europe, cosmetic microbeads could be adding up to 8,627 tonnes of plastic per year to the marine environment[32].

Secondary microplastics

Macroplastics ï the breakdown of larger items

The EU Marine Strategy Framework Directive (MSFD) defines marine litter as ñany persistent, manufactured or processed solid material discarded, disposed of or abandoned in the (marine and coastal) environmentò[33].Considerable progress has been made in the determination of the amount and location of plastic litter in our seas.

Now in its 25th year, the Marine Conservation Societyôs õBeachwatchô programme holds extensive data on the volume and types of litter being found on our beaches. Last yearôs results (2017) showed that on average 718 pieces of litter were found on every 100m stretch of beach surveyed within the UK.

Surveys undertaken on 25 beaches in Wales over the same weekend in September 2017 shows that the average amount of litter collected has increased by 11% since 2016 (now equating to an average of 677 items per 100m stretch). The amount of single use plastic items found, such as bottles, coffee cups, lids, straws and takeaway containers, increased by 13%.

Plastic and polystyrene pieces continue to rank 1st in litter items found (avg. 255 pieces per 100m in the UK), with food packaging, and plastic caps and lids, also ranking in the top 5 items littered. Cigarette butts, wet wipes and the remains of plastic cotton buds sticks, were also within the top 10 litter items found in the UK.

Plastic litter will contribute significantly to the release of microplastics into the marine environment, when nothing is done to remove the existing plastic mass and reduce the influx of litter. It is often stated that approximately 80% of marine litter arises from land-based sources and the remaining 20% come from sea-based sources[34].

Fibres from washing clothes

One of the first studies on fibre release from laundry in relation to environmental exposure was published by Browne et al.[35]

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[32] Sherrington, C., Darrah, C., Hann, S., Cole, G., Corbin, M. (2016). Study to support the development of measures to combat a range of marine litter sources. Report for European Commission DG Environment

[33] Galgani, F., D. Fleet, J. van Franeker, S. Katsanevakis, T. Maes, J. Mouat, L. Oosterbaan, I. Poitou, G. hanke, R. Thompson, E. Amata, A. birkun, and C. Janssen, 2010, Marine Strategy Framework Directive. Task Group 10 Report. Marine Litter, JRC, EUR 24340, 57 pages.

[34] UNEP, 2014, Valuing plastics: The business case for measuring, managing and disclosing plastic use in the consumer goods industry, United Nations Environment Programme, 116 pages.

[35] Browne, M.A., P. Crump, S.J. Niven, E. Teuten, A. Tonkin, T. Galloway, and R. Thompson, Accumulation of Microplastic on Shorelines Woldwide: Sources and Sinks. Environmental Science & Technology, 2011. 45(21): p. 9175-9179

They found that up to more than 1900 fibres per garment, per wash, or 100-300 fibres per litre effluent could be released.

The amount of microfibre released from clothing can vary greatly, however de Falco et al[36] highlight factors which may contribute. This is in a large part down to the fabrics, laundry products and washes used:

- An increased amount of microfibres is released by woven polyester
- Softener and bleach reduce fibres damage and breaks
- High temperature, washing time and mechanical action increase microfibre release

Falco et al found that the number of microfibres released from a typical 5 kg wash load of polyester fabrics was estimated to be over 6,000,000 depending on the type of detergent used. The usage of a softener during washes reduces the number of microfibres released of more than 35%. Importantly, the amount and size of released microfibres confirm that they cannot be totally retained by wastewater treatments plants, and will therefore escape into the aquatic environment.

Road dust from tyres, pavements and road markings

Rubber in tyre treads, polymers added to strengthen the bitumen used in road pavement, and thermoplastic elastomers in road marking paints, are believed to be the main contributors to microplastic particles in road dust.

It is believed that the majority of road-dust associated microplastic particles enter the environment as runoff from the road and road verges. Since the weather is such an important factor for local distribution, runoff may vary day to day and with season. A current report produced for the Environment Agency of Norway[37] suggests there is a lack of evidence to enable us to understand the extent to which these microplastic particles are removed by existing waste water treatment facilities.

Sewage sludge

Most household waste water is treated at municipal sewage treatment plants (STP). Many industries have their own treatment installations or filters at their disposal. Microplastics are not recycled and, due to their limited size, it is difficult for sewage treatment plants to filter all microplastics out of the water. Only limited data is available on the treatment efficiency of sewage treatment plants regarding microplastics.

In a study conducted by the VU University Amsterdam[38], research was conducted into the presence of microplastics in various flows at the Heenvliet sewage treatment plant. In this

[36] Francesca De Falco,Maria Pia Gullo,Gennaro Gentile,Emilia Di Pace,Mariacristina Cocca,Laura Gelabert,Marolda Brouta-Agnésa,Angels Rovira,Rosa Escudero,Raquel Villalba,Raffaella Mossotti,Alessio Montarsolo,Sara Gavignano,Claudio Tonin et al. 2018, Evaluation of microplastic release caused by textile washing processes of synthetic fabrics, Environmental Pollution, Volume 236, May 2018, pages 916-925

[37] Christian Vogelsang, Amy L. Lusher, Mona E. Dadkhah, Ingrid Sundvor, Muhammad Umar, Sissel B. Ranneklev, David Eidsvoll and Sondre Meland. (2018). Microplastics in road dust – characteristics, pathways and measures. Norwegian Insitute for Water Research report to the Norwegian Environment Agency.

[38] Leslie, H., M. Moester, M. de Kreuk, and D. Vethaak, Verkennende studie naar lozing van microplastics door rwzi's. H2O, 2012. 14/15: p. 45-47.

exploratory study, 90% of the microplastics were removed by the treatment process. This means that the remaining 10% enters the surface water, from where it can reach the sea.

A 2016 study suggests that the practice of spreading sewage sludge (a bi-product of water treatment) onto farmlands may result in between 125 and 850 tons microplastics/million inhabitants being added annually to European agricultural soils either through direct application of sewage sludge or as processed biosolids. The environmental and/or human health consequences of this are unknown[39].

Furthermore, it is estimated that approximately two thirds of laundry fibres are retained in sewage sludge. Depending on national policies on the spreading of sewage sludge on land, these emissions could enter the environment, and could be redistributed to surface water through runoff into rivers[40].

3. **How comprehensive is our knowledge about the scale of microplastic pollution and its effects? What should the research priorities be?**

Research into the impacts of microplastics

The full consequences of impacts of ingestion of microplastics on wildlife and human health are not yet fully understood and would benefit from greater research, particularly for ôscaling upõ of impacts e.g. how do we estimate the impact of microplastic ingestion in laboratory studies on plankton to wild populations in rivers, seas and oceans?

Dafne et al (2015) suggest the following research on all microplastics is needed to better understand human impacts:

- Transfer of chemicals to food; either chemicals inherent in microplastics or chemicals sorbed and transported by microplastics.
- Interactions of fishery/aquaculture species with microplastics and whether these interactions affect the edibility or marketability of fish/aquaculture species.
- Whether application of sewage sludge to terrestrial systems for agricultural reasons may lead to transfer of microplastics and/or chemicals to soil used in growing food.
- Economic considerations, such as whether microplastic presence in aquaculture species could lead to loss in revenues, or the extent of costs associated with clean-up efforts[41].

That said, there is a growing body of evidence to suggest impacts could be significant, particularly for the wide ranging impacts from macroplastics on the marine environment (see response to question 1), so whilst knowledge of the environment and human health impacts and the associated costs is far from complete, there is already a strong case to act now.

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[39] Nizzetto, L., Futter, M. and Langaas, S. (2017) 'Are agricultural soils dumps for microplastics of urban origins?', Environmental Science & Technology

[40] OSPAR commission (2017) Assessment document of land-based inputs of microplastics in the marine environment, page 25

[41] Dafne, E., Thompson, R., Aldridge, D., 2015. Microplastics in freshwater systems: A review of the emerging threats, identification of knowledge gaps and prioritisation of research needs. Water Research, Vol 75 (2015), pg 63-82. http://wedocs.unep.org/bitstream/handle/20.500.11822/17933/Microplastics_in_freshwater_systems_A_review.pdf?sequence=1

Understanding the pathways of microplastics

Dafne et al[42] point out that, given that the study of microplastics in freshwaters has only arisen in the last few years, we are still limited in our understanding of:

- their presence and distribution in the environment;
- their transport pathways and factors that affect distributions;
- methods for their accurate detection and quantification;
- the extent and relevance of their impacts on aquatic life.

Specific types of microplastic that would benefit from a greater research include:

- Plastic pre-production pellets **-** A larger volume of research into pellet loss has been carried out in the US than in the UK and, as a consequence, the Eunomia report into UK plastic pellet emissions looks to the US for current research and findings. Further research into pellet loss in the UK, including the key causes and amount of loss, would enable a greater understanding of this issue and would help to support solutions to this problem in Wales.
- Pathways and impacts of microbeads and microfibres (see recommendations from Dafne et al above)
- Road dust from tyres, pavements and road markings - There is generally a lack of evidence to enable understanding of the levels of road-dust associated microplastic particles present in road runoff entering existing waste water treatment facilities, and the extent to which these microplastics can be removed. There also appears to be limited documentation regarding the presence of microplastic particles from road marking paints in the environment. Macroplastic littering could also be an important secondary source to microplastics in road dust.
- Sewage sludge - more research is needed on: the sources of microplastic contained within sludge (including from the washing of synthetic clothes) and at what levels; the levels of microplastics that escape through sewage treatment plants, and; the rate at which microplastics escape from spread on farmland to surrounding waterways.
- Macroplastics as a source of microplastic - in Wales, more research is needed on: the identification of the sources of Welsh litter; the rivers and beaches in Wales which may be accreting or disposing litter; identification of the types of litter found; and, solutions to reduce litter at source (such as understanding the feasibility of introducing a Deposit Return System for single use items in Wales ï see response to question 4).

Increasing the level of understanding in these areas is essential if we are to develop appropriate policy and management tools to address this emerging issue.

[42] Dafne, E., Thompson, R., Aldridge, D., 2015. Microplastics in freshwater systems: A review of the emerging threats, identification of knowledge gaps and prioritisation of research needs. Water Research, Vol 75 (2015), pg 63-82. http://wedocs.unep.org/bitstream/handle/20.500.11822/17933/Microplastics_in_freshwater_systems_A_review.pdf?sequence=1

4. **What is currently being done to minimise the release of microplastics into the environment? What more can be done, and by whom, to address this issue within Wales?**

Although the origins of primary and secondary microplastics may differ, both are a persistent problem for marine and aquatic life which need to be addressed as a matter of priority. Furthermore, eliminating microplastic and indeed all plastic pollution at source is the only viable way forward financially, technically, and environmentally.

Primary microplastics

Microbeads

On the 30th June 2018, a ban on the production and sale of products containing microbeads in cosmetics came into force in Wales under the Environmental Protection (Microbeads) (Wales) Regulations 2018. This is a significant step towards reducing sources of plastics to the marine environment. However, to be effective, the ban must be effectively enforced and must be extended to include microbeads contained in other products such as industrial and household cleaning products and leave on cosmetics.

Pre-production plastic ópelletsô

The Eunomia report into plastic pellet emissions in the UK[43] highlight that key factors resulting in pellet loss include:

- How pellets are packaged for transport ï pellets in bags and boxes are easier to spill than tankers;
- Whether pellets are handled inside or outside ï spills inside are much easier to contain and clean up;
- Manual vs. machinery handling ï greater risk of spillage from manual handling;
- How waste pellets are stored for disposal; and
- Management practices employed ï to reduce spills and losses.

The report recommends that the UK plastic industry establishes the effectiveness of the pellet loss reduction measures contained in Operation Clean Sweep (the industryôs best practise approach to addressing pellet loss). The report also recommends that the plastics industry and other stakeholders work to address information gaps to improve the estimates of pellet loss to determine how best to focus further action. This could in part be achieved through establishing the effectiveness of Operation Clean Sweep.

The report also recommends establishing a means for enforcement and prioritising resources for enforcement to reduce plastic pellet loss. Enforcement can be part of the solution to addressing pellet loss but it may require legislative tools and resources. A shorter term approach would be industry funded self-regulation, involving third party measurements and spot checks on facilities.

[43] Sherrington, C. (2016). Study to Quantify Pellet Emissions in the UK, Eunomia Report to Fidra

Secondary microplastics

Macroplastics ï breakdown of larger items:

Current initiatives at the Welsh Governmentôs disposal to reduce introduction of macroplastics into the environment include:

- Creating a circular economy: Macroplastics in our aquatic and maritime environments are a visual sign of a failure to achieve a circular economy. Working with industry and the public, the Welsh Government must focus more on the reduction of, rather than the recycling of, materials. Best practise, from how products are designed, to how they are recycled, must be incentivised to ensure material and resources are valued. Initiatives that must be taken forward include:

    - Extending Producer Responsibility (EPR): The objective of extended producer responsibility (EPR) schemes are to ensure that responsibility for collecting or taking back used goods, and for sorting and treating for their eventual recycling, lies with producers. Such responsibility may be simply financial or, additionally, organisational. EPR is consistent with the polluter pays principle in that it is intended to shift the end-of-life costs away from citizens/taxpayers, towards producers/consumers. It can also be designed in such a way as to provide financial incentives to design products and packaging so as to facilitate recycling at the end of life. Under the UKôs current approach to producer responsibility for packaging, which is very different to most other packaging EPR schemes in Europe, it is estimated that only 10% of the costs of dealing with the materials at end of life are covered by producers. The rest are covered by taxpayers. This leads to very little incentive to improve practices.

    - A tax or levy on single use items: MCS Beachwatch data demonstrates that between 2016-7 the amount of single-use plastic found on beaches (such as bottles, coffee cups, lids, straws and takeaway containers) increased by 13% in Wales. The success of the carrier bag charge in Wales demonstrates that placing a value on a single-use item is effective in changing consumer behaviour.

    - Deposit return systems (DRS) for drinks containers: This initiative already work well in over 40 countries or states worldwide including parts of Australia, Norway, Lithuania and some US states. In South Australia, which has a DRS, only 2.9% of litter is beverage containers. In Western Australia, with no DRS, drinks containers make up 13% of litter[44]. Such systems can reduce littering, increase high quality recycling and reduce costs for local authorities. Like the carrier bag charge, it is a simple idea that can have an immediate effect. As of the 8th May 2018, the Welsh Government has committed to explore the feasibility of introducing DRS in Wales working together with the rest of the UK, however, no timescale has been committed to this, and it is yet to become clear how this will work. Should there be

[44] Eunomia. (2017) Impacts of a Deposit Refund System for One-way Beverage Packaging on Local Authority Waste Services. Report commissioned by Keep Britain Tidy, Campaign to Protect Rural England, Marine Conservation Society, Surfers Against Sewage, Reloop, Melissa and Stephen Murdoch. https://www.mcsuk.org/media/eunomia-report-on-drs.pdf

delays within the other Devolved Administrations, Wales should commit to taking this commitment forward at a national scale.

- Additional behaviour change initiatives: such as the eco-schools (litter education) programme, fixed penalty notices (FPN) for littering, and public awareness initiatives such as MCSôs Stop the Unflushables (wet wipes), Donôt Let Go (ban on balloon and sky lanterns), and Stop Sucking (ban on straws) campaigns.

- Funding clean-up operations: such as booms for rivers, and beach and river clean-ups, although these should be viewed as a ólast resortô for stopping litter from impacting on our riverine and marine environments.

Road dust from tyres, pavements and road markings

In addition to sustainable drainage systems and compact technical treatment units, in the 2018 report produced for the Norwegian Environment Agency, several novel ideas have been suggested which have the potential to minimise the amount of road dust associated microplastic particles from entering the aquatic and marine environments via rainwater runoff. One additional option could be to apply ónature-basedô solutions to retain and prevent runoff on the surface, and where needed and possible, treat the runoff, by infiltration in native soil as close to the source area as possible. The operational performance and need for maintenance of this low-cost solution would also be easy to monitor.

Microfibres

The Plastic Pollution Coalition have produced a comprehensive list of ways in which consumers can reduce the amount of microfibres escaping during washes. Notable actions include:

- Purchasing clothing made from natural fibres, such as cotton, linen and wool. Natural fibres will eventually break down in the environment, whereas plastic fibres will never go away.
- Washing synthetic clothes less frequently, and for a shorter duration.
- Using a cooler wash setting: Higher temperature can damage clothes and release more fibres.
- Use laundry liquid as opposed to powder: laundry powder ñscrubsò and loosens more microfibres.
- Purchasing a ówash bagô to contain clothing when washing which enables consumers to dispose of microfibres collected responsibly.
- Purchasing a washing machine discharge filter which is able to screen out synthetic microfibres.

Please do not hesitate to contact us if you wish to discuss any part of our evidence.

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