Further Evidence: Marine and Fisheries evidence session to the Rural Affairs Committee

Submitted by Fidra, 30 October 2026

Thank you for inviting Fidra to the *Marine and Fisheries* evidence session of the Rural Affairs Committee on Wednesday 30 September 2026. We welcome the opportunity to provide further information following this session.

Fidra's evidence focused on a pressure that can be overlooked in marine policy discussions yet is known to impact marine life and coastal communities: **plastic and chemical pollution reaching the marine environment from land**. Marine Protected Areas are part of the answer, but it is very hard to protect a designated area from pollution. Source controls, robust monitoring and follow-up action are needed alongside spatial protection, and the marine environment needs to be at the centre of decisions made on land.

We have set out below further information on microplastic and chemical pollution, focusing on case studies of plastic pellets (nurdles) and the use of sewage sludge on farmland, together with the actions the Committee could consider in this parliamentary session.

Pollution as a pressure on the seabed

The benthic environment plays a critical underpinning role in the rest of the marine ecosystem and needs to be protected and preserved as far as possible. Fidra's work on Scottish salmon farming looked at impacts of aquaculture on the benthic environment[1] and supports concerns raised by other witnesses during this session about feed, chemical treatments and waste. Decisions on where aquaculture is sited, and how it is managed, also need careful consideration.

Pollution is another major pressure on the seabed, and it acts alongside the physical and organic impacts of activities such as aquaculture. Seabed sediments are the ultimate sink for many contaminants entering the marine environment, including microplastics [2,3], trace metals[4] and persistent chemicals such as PFAS[5]. Once

[1] Fidra. (2022). *The impacts of Scottish salmon farming on the benthic environment*. Available at: https://www.fidra.org.uk/wp-content/uploads/Impacts-of-Scottish-salmon-farming-on-the-benthic-environment-.pdf

[2] Woodall, L.C. *et al.* (2014). 'The deep sea is a major sink for microplastic debris', *Royal Society Open Science*, 1(4), 140317. doi:10.1098/rsos.140317.

[3] Martin, C., Young, C.A., Valluzzi, L. and Duarte, C.M. (2022). 'Ocean sediments as the global sink for marine micro- and mesoplastics', *Limnology and Oceanography Letters*. doi:10.1002/lol2.10257.

[4] Bruland, K.W., Middag, R., & Lohan, M.C. (2014). Controls of trace metals in seawater. In: Holland, H.D. & Turekian, K.K. (Eds.), *Treatise on Geochemistry* (2nd ed.), Chapter 8.2, pp. 19-51. Elsevier, Oxford. https://doi.org/10.1016/B978-0-08-095975-7.00602-1

[5] Burkhard, L.P. and Votava, L.K. (2022). 'Biota-sediment accumulation factors (BSAFs) for per- and polyfluorinated substances (PFAS)', *Environmental Toxicology and Chemistry*. doi:10.1002/etc.5526.

deposited, these contaminants can be taken up by sediment-dwelling organisms and potentially pass up the food web[6]. It is estimated that 1.5–4% of all plastics produced globally enter the ocean each year[7], impacting already vulnerable wildlife and ecosystems. Marine Protected Areas are an important part of the response, but they offer limited protected against pollutants that arrive from outside their boundaries, so a site-based approach alone cannot keep these contaminants out. Marine policy needs to look at the wider picture, with effective source controls on land and in the catchment and effective monitoring of pollutant levels in sediments and the surrounding environment. High levels of pollutants should trigger action to trace and address sources, whether through environmental authorisations and permit conditions or through remediation or clean up measures.

Plastic pellet pollution

Plastic pellets, also known as nurdles, are the starting material used to make all plastic products. Scotland is both a source and a sink for pellet pollution. Grangemouth is responsible for a third of UK plastics production,[8] and the Global Plastic Pellet Supply Chain report identified Scotland as a hotspot for chronic pollution from the ongoing loss of pellets, within global annual loss estimates as high as 445,970 tonnes.[9]

Pellets wash up on beaches around Scotland, with particularly high accumulations in the Firth of Forth. Fidra's citizen science programme the Great Nurdle Hunt has involved more than 9,000 volunteers in over 3,000 nurdle hunts, since 2013 across the UK. Over 1,000 of these hunts have taken place in Scotland, and communities have reported seeing pellet pollution coming straight from the plastics industry. In addition, Scotland is at high risk of marine spills. In 2025, pellets that were shipped from Scotland spilled into the North Sea following a vessel collision resulting in nurdle pollution along the east coast of England impacting nature reserves and sensitive areas for wildlife.

[6] Wang, C., Magnuson, J.T., Zheng, C. and Qiu, W. (2025). 'Incidence of pollution, bioaccumulation, biomagnification, and toxic effects of per- and polyfluoroalkyl substances (PFAS) in aquatic ecosystems: a review', *Aquatic Toxicology*, 107469. doi:10.1016/j.aquatox.2025.107469.

[7] Tsiaras, K., Costa, E., Morgana, S., Gambardella, C., Piazza, V., Faimali, M., et al. (2022). Microplastics in the Mediterranean: Variability From Observations and Model Analysis. Front Mar Sci. 10;9:784937. doi:10.3389/fmars.2022.784937

[8] Eunomia. (2018). Investigating options for reducing releases in the aquatic environment of microplastics emitted by (but not intentionally added in) products. Available at: https://www.eunomia.co.uk/reports-tools/investigatingoptions-for-reducing-releases-in-the-aquatic-environment-of-microplastics-emitted-by-products/

[9] Oracle Environmental Experts. (2023). Mapping the global plastic pellet supply chain. Pg 77. Available at: https://hub.nurdlehunt.org/resource/oee-mapping-the-global-plastic-pellet-supply-chain-report-only/

Impacts on wildlife and communities

Pellets are mistaken for food by wildlife, leading to organ damage and starvation, while toxic chemicals and plastics can enter the food chain.[10,11] Pellets can also adsorb and transport toxic chemicals[12] and pathogens such as *E. coli*, which has been documented on pellets in Scotland.[13]

Pellet pollution also matters to the fishing industry. Large pellet spills, such as those in Hong Kong and Sri Lanka, have forced fisheries to close. After the July 2026 spill in north-east England, local small-scale fishers told Fidra they were worried about pellets being sucked into boat engines and about the effect on mackerel, as the white pellets could mimic a food source. Preventing pellet pollution protects fisheries as well as wildlife and communities. In the Firth of Forth the nurdle pollution is some of worst reported to us from around the world. Here, nurdle pollution impacts the local environment, including SSSIs, and local communities who report that the nurdle pollution is so high they would not visit their local beach, as one local resident put it 'I wouldn't let my dog walk on that'. These high levels of nurdle pollution limit communities' access and enjoyment of the local area and curtail opportunities for coastal businesses and tourism.

Prevention across the supply chain

95% of pellet loss is preventable[1], but this requires regulation across the whole supply chain. More than 30 companies handle plastic pellets in the Firth of Forth alone, and all of them need prevention measures in place.

Scotland has led the way through supporting the development of British Standards Institution PAS 510:2021,[14] the first standard aiming to prevent pellet pollution, but it has not been adopted by the entire plastic supply chain. Voluntary industry schemes have had limited take-up and are not fit for purpose. Robust standards should become the basis of a legislated, independently audited supply chain approach, with a public register so that all actors meet the requirements and work only with others that do. In 2025, new EU regulation was brought in to prevent pellet pollution from across the plastic supply chain with a 'Zero pellet loss' goal. Though operators handling under 1,500 tonnes per year 'self-certify', this regulation is an important step towards pollution prevention. As Scottish Government's policy is to maintain and

[10] Charlton-Howard, H. S., Bond, A. L., Rivers-Auty, J., & Lavers, J. L. (2023). 'Plasticosis': Characterising macro- and microplastic-associated fibrosis in seabird tissues. *Journal of Hazardous Materials*, *450*, 131090. https://doi.org/10.1016/j.jhazmat.2023.131090

[11] Cverenkárová, K., Valachovičová, M., Mackuľak, T., Žemlička, L., & Bírošová, L. (2021). Microplastics in the Food Chain. *Life*, *11*(12), 1349. https://doi.org/10.3390/life11121349

[12] International Pellet Watch data. Available at http://pelletwatch.org/

[13] Rodrigues, I., Oliver, D.M., McCarron, A., Quilliam, R. S., (2019). Colonisation of plastic pellets (nurdles) by E. coli at public bathing beaches, *Marine Pollution Bulletin*, 139, 376-380. https://doi.org/10.1016/j.marpolbul.2019.01.011

[14] BSI. (2021). PAS 510:2021. Plastic pellets, flakes and powders. Handling and management throughout the supply chain to prevent their leakage to the environment. Available at: https://www.bsigroup.com/en-GB/standards/pas-5102021/

advance environmental standards by keeping pace with European Union environmental law, regulation is needed here to ensure plastic pellet loss prevention.

Preparedness, clean-up and polluter pays

Pellet spills are a risk to Scotland. Two spills occurred off the east coast of the UK within 18 months, one involving pellets from Scotland, and in both cases, it took days for the right equipment and specialist clean-up crews to arrive[15]. Local councils need preparedness plans so they can act within hours, not days, and a pellet spill protocol would help to reduce the impact of a spill on biodiversity and communities.

Councils also need support to clean up both marine spills and Scotland's huge legacy pollution sites. Currently councils focus on litter management rather than the clean-up of heavily polluted beaches, and SEPA has not operationalised the polluter pays principle for pellets, in part because enforcement depends on attributing pollution to specific companies rather than taking a sector-wide approach. Responsibility and costs for prevention, clean-up, restoration and compensation should be borne by the plastic supply chain, but they must be legislated for and enforced. This work does not fall within one directorate and needs cross-government thinking at national and local level, alongside continued support for international action through OSPAR, the International Maritime Organisation and the UN Global Plastics Treaty.

Microplastics and regulatory alignment

Commitments have been made to maintain alignment with EU regulatory developments aimed at reducing microplastics in the marine environment, but these have not been fully followed through. An example of lack of action would be the use of artificial turf microplastic infill, which leaches easily from pitches into soil, rivers and the sea. A report commissioned by the UK government identified artificial sports pitches as the largest source of intentionally added microplastics (excluding plastic pellets) entering the UK environment [16]. The EU has already regulated this and is phasing the infill out over the next few years. This is a simple measure that Scotland could introduce.

Chemical contamination of wildlife and fisheries

Pollution is affecting marine species through the accumulation of persistent industrial chemicals in wildlife and fish, with implications for marine ecosystems and fisheries. Studies of northern gannet eggs from Bass Rock have detected forever chemicals

[15] Fidra. (2026). Plastic pellets pollute the east coast of England 12 months after ships crash in North Sea. Available at: [https://hub.nurdlehunt.org/resource/fidra-case-study-north-sea-spill-2025/

[16] Defra. (2025). Option Appraisal for Intentionally Added Microplastics - CB04121. Available from: https://sciencesearch.defra.gov.uk/ProjectDetails?ProjectId=21802

PFAS (poly or per fluoro-alkyl substances)[17] and brominated flame retardants[18], with declines in some banned chemicals alongside increases in similar chemicals that have not been restricted, highlighting the importance of taking a group approach to chemical restrictions. More recent research[19] found PFAS and pharmaceutical residues in demersal fish species in North West Scotland (including species with commercial fisheries such as Whiting), detecting perfluorodecanoic acid (PFDA) in all 41 fish sampled. The UK currently has no safety limit for PFDA. The researchers estimated that exposure from consuming some of these fish could exceed the US Environmental Protection Agency's recommended limit by up to approximately 500-fold. This demonstrates that chemical contamination is not only a concern for marine wildlife but also relevant to fisheries and potential human exposure, reinforcing the need for stronger chemical regulation and continued monitoring of marine species.

Since Brexit the UK has failed to effectively regulate chemicals, with few updates to chemical regulations since 2021. These regulations are the joint responsibility of UK Government and Devolved Administrations under the common framework. Restrictions on harmful substances has stalled (see Fidra's alignment page), with just 3 restrictions progressing compared to EU's 14. This growing gap leaves the environment, particularly Scotland's marine environment, increasingly at risk. The UK Government and the Devolved Governments, including the Scottish Government, are required to set the strategic direction for the UK regulatory regime and ensure that existing environmental and human health standards are maintained or exceeded. However, in relation to chemicals, current environmental standards are not being met. Scotland therefore has an important role in shaping the strategic direction of chemical regulation and ensuring that environmental and human health protections are strengthened. The Scottish Parliament also has a key role in scrutinising Scottish Ministers' decisions on legislative changes and regulatory work plans, as well as holding Ministers to account for ensuring that chemical regulation is effectively delivered and implemented in Scotland.

Monitoring gaps

While there is some useful academic research that demonstrates the issue of chemical pollution in Scotland's marine environment there are significant gaps in ongoing monitoring that need to be addressed. Although the Scottish Environment Protection Agency (SEPA) has published data on PFAS contamination, its 2025 monitoring programme focused on surface waters and groundwater, leaving a need for further investigation of coastal waters and estuaries. Furthermore, Scotland has yet to fully align its Water Framework Directive standards with recent updates to the

[17] Pereira, M.G., Lacorte, S., Walker, L.A. and Shore, R.F. (2021). 'Contrasting long term temporal trends in perfluoroalkyl substances (PFAS) in eggs of the northern gannet (Morus bassanus) from two UK colonies', Science of the Total Environment, 754, 141900. https://doi.org/10.1016/j.scitotenv.2020.141900

[18] Crosse, J.D., Shore, R.F., Jones, K.C. and Pereira, M.G. (2012). 'Long term trends in PBDE concentrations in gannet (Morus bassanus) eggs from two UK colonies', Environmental Pollution, 161, pp. 93–100. https://doi.org/10.1016/j.envpol.2011.10.003

[19] Castle, A., Machidon, M., Yan, C., Hollywood, K.A., Shiels, H.A. and Shultz, S. (2026). 'PFAS "forever" chemicals and active pharmaceutical ingredients (APIs) are widespread in UK fisheries', Science of the Total Environment, 1048, article 182035. https://doi.org/10.1016/j.scitotenv.2026.182035

EU's list of priority substances, which include additional pollutants such as PFAS, pharmaceuticals and bisphenol A[20]. Research by the University of York and Fidra detected a type of PFAS called TFA in 98% of 54 sampling sites across 32 UK rivers, highlighting the widespread presence of this persistent chemical. Rivers can transport TFA from land into estuaries and coastal waters, potentially contributing to marine pollution. Scotland's River Kelvin has some of the highest levels of TFA detected globally. Although further research is needed to establish its impact on marine ecosystems, these findings highlight the need for monitoring from rivers to sea[21]. Emerging and EU watchlist chemicals that may enter the marine environment require continued monitoring to identify potential risks. More comprehensive monitoring and data collection are essential, but these must be accompanied by effective follow-up action to reduce pollution, where concerns are identified through government monitoring, academic research or citizen science.

Sewage sludge

Sewage sludge is a clear example of how contaminants within the circular economy can move from land to sea, as sludge from wastewater treatment plants is applied to agricultural soils can introduce chemicals that are transported through surface runoff and rivers into the marine environment. Fidra, alongside the Environmental Rights Centre for Scotland, have called for a moratorium on the application of sewage sludge to land[22]. Sewage sludge acts as a sink for the harmful and persistent contaminants removed from wastewater, and these are almost impossible to remove from the final product[23]. It contains some nutrients but also microplastics, pathogens and chemicals. Around 60% of Scotland's treated sewage sludge is applied to agricultural soils[24].

Sludge route from land to sea

Microplastics are a threat to terrestrial ecosystems,[25] and once sludge is applied to land, nutrients and closely associated contaminants can be transported from soil into rivers and out to the oceans[26]. Soil is a finite resource vital to food security, the

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[20] European Parliament and Council of the European Union (2026) Directive (EU) 2026/805 amending Directive 2000/60/EC, Directive 2006/118/EC and Directive 2008/105/EC as regards priority substances in the field of water policy. Available at: https://eur-lex.europa.eu/eli/dir/2026/805

[21] Li, J., Boxall, A.B.A., Swan, C., Wilkinson, J., McGimpsey, N., Evans, H., Kirton, M., Stanforth, R., Gunby, C., Niemi, L., Taggart, M., Robison-Smith, C., Tarring, E., Bloor, M., & Gauchotte-Lindsay, C. (2025). *Concentrations of Trifluoroacetic Acid (TFA) in UK Surface Waters*. University of York and Fidra.

[22] Environmental Rights Centre for Scotland (ERCS) and Fidra (2026) *The risks of sewage sludge spreading on agricultural land and the need to re-evaluate*. Joint briefing, March 2026. Available at: https://fidra.org.uk/download/sewage-sludge-risks-scotland/

[23] Sewage sludge and the circular economy, European Environment Agency, 2021.

[24] https://www.scotlink.org/wp-content/uploads/2023/04/The-application-of-sewage-sludge-to-agricultural-land-in-Scotland.pdf

[25] de Souza Machado, A. A. et al. (2018) Microplastics as an emerging threat to terrestrial ecosystems, Global Change Biology, 24, 1405-1416. doi: 10.1111/gcb.14020.

[26] NatureScot Research Report 1343, Source to Sea: enabling coherent, efficient and synergistic outcomes. https://www.nature.scot/doc/naturescot-research-report-1343-source-sea-enabling-coherent-efficient-and-synergistic-outcomes

economy and biodiversity, so action is needed to avert legacy contamination. Approximately 99% of microplastics within sewage sludge applied to farmland migrate to aquatic environments[27].

Regulation does not reflect what sludge now contains

Fidra welcomes Scotland's move away from the 1989 Sludge (Use in Agriculture) Regulations and incorporation of sewage sludge under the Environmental Authorisation (Scotland) Regulations 2018. However, these regulations still only control metals and pathogens within treated sewage sludge and have no limits for chemicals such as PFAS, bisphenols, or flame retardants, or for microplastics. The Biosolids Assurance Scheme and current regulations do not reflect the modern composition of sludge.[28] Without testing for this complex mixture of contaminants, the precautionary approach should apply until levels are proven safe.[29]

Upstream and downstream solutions

Upstream, harmful chemicals and microplastics need to be kept out of Scotland's wastewater through restrictions and control at source. Downstream, wastes containing persistent organic pollutants should be processed so that the pollutants are destroyed or irreversibly transformed. For example, destroying persistent PFAS requires combustion temperatures above 1000 °C.[30] Fidra recognises the potential value of sludge as a resource in a circular economy, but contaminated sludge should not be applied to land until it is proven clean and safe due to the impacts on soil [31] and the wider environment.

Recommendations

We ask the Committee to consider scrutinising further:

- Cross-government working so that decisions on land, including planning and regulation, take the marine environment into account.
- Progress towards legislation requiring all actors in the plastic pellet supply chain to implement, verify and report pellet loss prevention measures, based

[27] Crossman, J., Hurley, R.R., Futter, M., & Nizzetto, L. (2020). Transfer and transport of microplastics from biosolids to agricultural soils and the wider environment. *Science of the Total Environment*, *724*, 138334. https://doi.org/10.1016/j.scitotenv.2020.138334

[28] Assured Biosolids: https://assuredbiosolids.co.uk/

[29] Pivato, A., et al. (2022) The role of the precautionary principle in the agricultural reuse of sewage sludge from urban wastewater treatment plants. Detritus. 19. 5-12. https://doi.org/10.31025/2611-4135/2022.15202

[30] US EPA (2019). Technical brief: PFAS incineration. https://www.epa.gov/sites/default/files/2019-09/documents/technical_brief_pfas_incineration_ioaa_approved_final_july_2019.pdf

[31] Hough, R.L. (2024) *Using new contaminants information to re-assess environmental risks from sewage sludge*. Final report, 5 December 2024. James Hutton Institute. Prepared for Fidra. Available at: https://fidra.org.uk/download/james-hutton-institute-re-assessment-of-environmental-risks-from-sewage-sludge/

on robust standards such as PAS 510:2021 and independent audits, with polluters paying for prevention, clean-up and compensation.

- Scotland's preparedness plans and spill protocols for pellet spills, and support for councils to clean up spills and legacy pollution.
- Scotland's chemical monitoring of the marine environment including PFAS monitoring in coastal waters and estuaries, updating the Water Framework Directive with the latest EU priority substances, and tracking watchlist chemicals.
- Whether science and monitoring results, including those from citizen science, lead to follow-up action that traces pollution to its sources and prevents pollution in the future.
- Progress on regulation to phase out microplastic artificial turf infill, in line with EU alignment commitments.
- The application of sewage sludge to land, given the absence of limits for contaminants such as PFAS and microplastics, with investment in upstream controls and in infrastructure able to destroy persistent pollutants, until these are in place a motorium on application is needed.
- Chemical regulation including UKREACH and GB CLP to ensure EU alignment is being delivered on chemicals and chemicals are being controlled at source through restrictions, authorisation list updates and appropriate hazard classifications.

Further Information

Please contact heather.mcfarlane@fidra.org.uk for more information.

About Fidra

Fidra is an environmental charity using the best available science to deliver solutions to environmental issues by working with governments, business and the public. Fidra is working to address threats to the environment from pollution and habitat degradation with projects to reduce the plastic and chemical pollution from plastic pellets, sewage sludge, pesticides and furniture. Our work has helped grow awareness of the harms from plastic and chemical pollution and is bringing in solutions to address it. We have reduced the use of harmful chemicals in receipts, supported retailers to move away from forever chemicals, PFAS in clothing and food packaging and raised awareness of the environmental impacts of salmon farming. Fidra is a Scottish registered charity and SCIO (no.SC043895).