

Output from plastics in the environment workshop

Quick wins

- **Washing machine microfiber regulation**
 - Understand release of microfibres during the washing process
 - Legislate to insist washing machine filters are fitted on all machines ***New machines only or retrofit through Water Fittings Regs too?**
 - Welsh Gov to lobby UK Gov to legislate for filters on washing machines
- **Research:**
 - Data Sharing
 - Identify key pathways for intervention e.g. collect road runoff, washing machine filters
 - Relationship between plastics & food system / food security
 - Transfer from air to agriculture/crops
 - Changes in GMP for product passports
 - Emerging chemical pollutants in water (Policy/Monitoring)
 - Effects of MiPs on nutrient recycling
- **Understand the impacts and toxicity of:**
 - Emerging chemical pollutants in water & the environment
 - Biodegradables
 - 'Green' alternatives to additives
 - Personal care products
 - Fibres and textile waste
 - Rubber tyre tread
 - Food products
- **Sampling, monitoring and Analysis:**
 - Risk informed targeting of monitoring design (ecosystem sensitivity, increased exposure) (RC)
 - Tech development – GC-VUV all-in-one plastics analysis (RG)
 - Volatile organics analysis (RG)
 - Emerging chemical pollutants in water (Policy/Monitoring)
 - Simple microplastics testing in environmental samples (suitable for schools)
 - Simplification of chemicals
 - Regulation and monitoring
- **Policy advocacy work on microplastics**
 - Understanding what level of evidence is needed from policy makers to make a decision
 - Welsh Gov to lobby UK Gov to legislate for filters on washing machines

- Harmonizing sampling and analysis of microplastic in waters upstream, Horizon Europe
- Joined-up approach with other governments, regulators etc.
- Evaluating solutions, also consider factors such as food security
- **Engagement**
 - Engaging with industries to see how a policy could be implemented
 - Changing public behaviour / educating communities about plastic microfiber
 - Reduce single use plastic production/sale
 - Plastic waste management

Current Research

Health Current Research

High Impact	<ul style="list-style-type: none"> - Simple microplastics testing in environmental samples – suitable for children (SPM) - Release of microfibres during the washing process (ST) 	<ul style="list-style-type: none"> - Marine pollution / new fuels (PH) 	<ul style="list-style-type: none"> - Public Awareness and culture change (SPM) - Policy - Scoping future plastics policy (OS) - Emerging Issues - Regulations - Inhalation of MNPs - UK Research (CM)
Low Impact		<ul style="list-style-type: none"> - Joined up WG Policy on indoor environmental quality affecting human health (MMcV) - Occupational exposure to bioaerosols in waste treatment - Reduction of single-use plastics in TfW (SD&KC) 	<ul style="list-style-type: none"> - MNPs and their impact (exacerbation / onset) on lung diseases - NNP geometry and creation of structure-activity relationships - Awareness and culture change action
Impact / Effort	Low Effort		High Effort

Water Current Research

High Impact	<ul style="list-style-type: none"> - 'Green' alternatives to additives and physiological impacts - Emerging chemical pollutants in water (Policy/Monitoring) (TA) - Harmonizing sampling and analysis of microplastic in waters upstream, Horizon Europe (RC) - Data Sharing 	<ul style="list-style-type: none"> - Understanding global litter trend / water-soluble polymer pollution (CRS) - PFAS 	<ul style="list-style-type: none"> - Bioremediation of hydrocarbons and plastic (PS)
Low Impact	<ul style="list-style-type: none"> - PAHs (TA) - Plastic settling behaviour (YZ) - Water soluble polymers / plastic litter (VH) 	<ul style="list-style-type: none"> - Wastewater treatment – emerging pollutants & improving efficiency / nutrient recovery (AH) - Legacy waste plastics and additives – NERC project 'CLEWS' (RC) - Removal & valorisation techniques in wastewater - Exploring the fate of MPs in the Conwy River – finding their sources and interactions with contaminants (Yashi) 	<ul style="list-style-type: none"> - MPs in wastewater effluents or sludges – FTIR, Raman pyr-GC-MS (LR) - Identifying the environmental risks posed by bio-based materials (aquatic) (TA) - Petrol v. bio-based plastics & assorted toxicity of additives (JC) - Cold adapted enzymes from marine bacteria <i>Alcecris-wrax??</i> (HM)
Impact / Effort	Low Effort		High Effort

Air Current Research

High Impact	<ul style="list-style-type: none"> - Plastics / food security (WC) - Characterising food products (RG) - Transfer from air to agriculture/crops (PF) - Characterising personal care products (RG) - Characterising fibres (WC) - Characterising rubber tyre tread (PF) - Tech development – GC-VUV all-in-one plastics analysis (RG) - Characterising textile waste (RG) - Toxicity of biodegradables (WC) - Volatile organics analysis (RG) 	<ul style="list-style-type: none"> - Ecosystem resilience to plastics (WC) - Participatory methods for collecting airborne microplastics in homes and schools (Ben) - Epigenetics study of plastic additives (RG) - PFAS analysis (RG) - Building national atmosphere network for MPs (PF) - Characterising microplastics in <10 + 2.5PM size fractions (Ben)
Low Impact	<ul style="list-style-type: none"> - Mapping environmental transformation of plastics (RG) - Measuring deposited airborne microplastics (Ben) - Fishing debris (WC) - Land to water flows (WC) - Passive v. active collection (PF) 	<ul style="list-style-type: none"> - Modelling to understand source and transport (PF) - Multiple stressors (WC) - Remote monitoring of pollutants (PFAS, Plastics, Additives) (RG) - Global comparison over the world urban v. rural (PF) - Bioremediation of plastics (RG) - Plastics in cows' milk (BW)
Impact / Effort	Low Effort	High Effort

Soil – Current Research

High Impact	<ul style="list-style-type: none"> - General policy advocacy work on microplastics (BL) - Effects of MiPs on nutrient recycling (MKR) 	<ul style="list-style-type: none"> - Circular economy solutions (BL) - Disposal of agricultural plastics (JS) - Potential sources of MPs in agricultural soil (MKR) - Organic spreading to land (GR)
Low Impact	<ul style="list-style-type: none"> - Microbiology (MT) - Organic and horticultural practices in Wales and the use of plastics (ST) - Actual degradation rate of biodegradable plastics in soil (MKR) 	<ul style="list-style-type: none"> - Plastic Biodegradation (MT) - Benefit of agricultural plastics on food security (MKR) - Regulate plastic additives
Impact / Effort	Low Effort	High Effort

Future Research

Health Future Research

High Impact	<ul style="list-style-type: none"> - Washing machine filters – legislate to insist fitted on all machines (SPM) - Engagement - Joined-up approach with other governments, regulators etc. (SD) - Engaging with industries to see how a policy could be implemented (KC) - Changing public behaviour / educating communities about plastic microfiber (ST) 	<ul style="list-style-type: none"> - Data and Evidence - Plastics: pollution, microplastics in the school curriculum (SPM) - What evidence suggests as the biggest threat to public health / evidence RE: health impact - Not treat plastics in isolation but as one of many environment / health issues / pressures (MMV) - Fast Fashion - Policies to reduce the release of microplastics into the environment (ST) - Data that informs effective risk assessment: exposure assessment, dose-response (PS)
Low Impact		<ul style="list-style-type: none"> - Policy and Regulation - Improved monitoring of microplastics - Stop production of unnecessary plastic – sustainable approach (-) - Joined-up approach to evidence – more resources needed
Impact / Effort	Low Effort	High Effort

Air Future Research

High Impact	<ul style="list-style-type: none"> - Simplification of chemicals (WC) - Changes in GMP for product passports (RG) - Plastics / food security (WC) - Evaluating solutions - Evaluating solutions (food security) (WC) 	<ul style="list-style-type: none"> - Eco / toxicological studies (BW) - Impact of alternative plastics (WC) - Prioritize on 'hazardous' plastics (PF) - Standards/harmonization of policy/manufacturing expectations (RG)
Low Impact	<ul style="list-style-type: none"> - Greater recognition of the need for interdisciplinary working to achieve 'big' solutions / 'hidden' single use plastics (RG) - Clearer guidance on plastics use - Product passports (RG) - Consider the location/environment 	<ul style="list-style-type: none"> - Characterizing sub 10 < 2.5 PM particles (BW) - Understanding inequalities of exposure (BW) - Consumer perceptions / what makes people do certain things and how can we influence choice (WC) - Measuring networks for spatial-temporal understanding - Greater leverage for regulators to impose / enforce rules/penalties on plastic pollution (RG) - Measurement intercomparison (BW)
Impact / Effort	Low Effort	High Effort

Water Future Research

<p>High Impact</p>	<ul style="list-style-type: none"> - What level of evidence is needed from policy makers to make a decision? - Risk informed targeting of monitoring design (ecosystem sensitivity, increased exposure) (RC) - Reduce single use plastic production/sale (TA) - Regulation and monitoring (MH) - Plastic waste management (YZ) - Identify key pathways for intervention e.g. collect road runoff, washing machine filters 	<ul style="list-style-type: none"> - Validate models for env. Fate predictions to inform exposure reduction measures - Public education on plastic/pollution crisis - Supporting researchers and multi-disciplinary / diverse interested stakeholders to create full life cycle solutions to water (TA) - Need to focus on marine vegetation and MPs accumulation in seagrass beds and mangrove ecosystems (CR) - Reduce use of non-essential plastics. Policy for producers and marketing (JC) 	<ul style="list-style-type: none"> - Industry Regs – demand info on products / additives (TA) - Greater regulation of formulations / additives in plastic manufacture - Identifiable, reliable, robust and affordable monitoring method (TA) - Aligning exposure and hazard assessment to inform on risks at a local scale (RC)
<p>Low Impact</p>	<ul style="list-style-type: none"> - Create public awareness about plastic use and its health disadvantages (PS) - Can low-tech monitoring(e.g. litter) inform on MP and NP exposure 	<ul style="list-style-type: none"> - Research approach on MPs and NPs absorption & removal techniques from the polluted areas (LR) - Source reduction (LR) - Clearer labelling requirements for 	<ul style="list-style-type: none"> - Multi-stressors – how do MNPs interact with ot dekkntents / stressors (JC) - Focus on sustainable alternatives for plastics like biodegradable bioplastics /

	<ul style="list-style-type: none"> - Single-use plastic reduction - Monitoring effluent discharges of WWTPs and set up more efficient threshold values for private sectors 	bio-based / biodegradable plastics and their disposal routes	bio-based plastics <ul style="list-style-type: none"> - ALTERNATIVES + SOLUTIONS / SOURCES / MONITORING/ Do we need to monitor? How do we decide? What evidence is needed? / IMPACTS
Impact / Effort	Low Effort		High Effort

Soils – Future Research

High Impact	<ul style="list-style-type: none"> - Pick off the low hanging fruit to start the ball rolling (BL) - Welsh Gov to lobby UK Gov to legislate for filters on washing machines (BL) 	<ul style="list-style-type: none"> - Engage with manufacturers!!! (MCR) - Regulate use of additives in agricultural plastics - Improve access for farmers to recycled plastics (iS)
Low Impact	-	<ul style="list-style-type: none"> - Fund plastic collection and recycling - Lifecycle assessments of plastics and additives in farms (MKR) - Improve public understanding of plastics – balanced arguments (MKR)
Impact / Effort	Low Effort	High Effort

AI SUMMARY

Quick Wins

Washing Machine Microfiber Regulation:

- Study microfiber release during washing.
- Mandate filters for all washing machines (new and retrofitted).

- Welsh Government to advocate for UK-wide legislation.

Research Priorities:

- Share data and identify intervention pathways (e.g., road runoff, washing machine filters).
- Investigate plastics' effects on food security, air-to-agriculture transfer, and nutrient recycling.
- Focus on emerging pollutants, biodegradables, and green additive alternatives.

Monitoring and Analysis:

- Target risk-based monitoring in sensitive ecosystems.
- Simplify microplastic testing (suitable for schools).
- Develop advanced techniques for plastics and pollutants analysis.

Policy Advocacy:

- Identify evidence needs for policymaking.
- Promote harmonized sampling and analysis across regions.
- Advocate for joined-up approaches between governments and industries.

Engagement:

- Collaborate with industries for feasible policy implementation.
- Drive public education on microfiber pollution and plastic waste reduction.
- Promote sustainable alternatives to single-use plastics.

Current Research Priorities

Health:

- High Impact: Simple environmental microplastics testing, microfiber release in washing, public awareness, and culture change.
- Low Impact: Indoor air quality, occupational bioaerosol exposure, single-use plastics impact on lung diseases.

Water:

- High Impact: Study green additives, marine litter, and bioremediation.
- Low Impact: Settling behavior, wastewater improvements, legacy plastics.

Air:

- High Impact: Food security, toxicological studies, and participatory monitoring of airborne microplastics.
- Low Impact: Transformation mapping, fishing debris, and rural vs. urban pollution comparisons.

Soil:

- High Impact: Nutrient recycling, circular economy solutions, agricultural plastic disposal.
 - Low Impact: Biodegradation rates and microbiological impacts.
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Future Research Directions**Health:**

- High Impact: Policies to mandate washing machine filters and educate the public.
- Low Impact: Integrated health-environment issue approaches.

Air:

- High Impact: Simplified chemical formulations and eco-toxicological studies.
- Low Impact: Guidance for plastics usage, interdisciplinary collaboration.

Water:

- High Impact: Regulation of additives, validated models for exposure reduction.
- Low Impact: Public awareness and low-tech monitoring methods.

Soil:

- High Impact: Advocacy for agricultural additives regulation, engaging manufacturers.
 - Low Impact: Improved recycling infrastructure and lifecycle assessments.
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