UNIVERSITY OF PLYMOUTH
Marine Institute

The Queen's Anniversary Prizes
For Higher and Further Education
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POLICY BRIEFING

PLASTICS & microplastic POLLUTION

Evidence comparing the solutions

EXECUTIVE SUMMARY

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The magnitude of the global environmental challenge associated with plastic pollution was recently acknowledged by agreement among 175 nations, including the UK, to develop a legally binding agreement by 2024 – the **UN Plastic Pollution Treaty.** If used responsibly plastics bring substantive benefits and are fundamental to addressing 21st Century challenges.

Our research on textile fibres, tyre particles, biodegradable plastics and mechanical clean-up devices indicates what works and what does not; illustrating the critical importance of robust evidence to guide the way. In the absence of such there is a real risk that interventions will be ineffective, or lead to unintended negative consequences. **UK research and innovation can address the key knowledge gaps** using transdisciplinary approaches to deliver environmental, societal and economic benefits.

SOCIAL CONTEXT

Around **400 million tonnes of plastic items are produced annually, 40% are single-use**. Plastics, when used responsibly, can bring substantial societal and environmental benefits, some of which are fundamental to addressing global challenges including food security, food waste and climate change. Yet plastic debris contaminates the natural world from the poles to the equator and from shallow waters to the deep sea; with associated impacts on economies, wildlife, and human health and wellbeing.

We urgently need to establish how to design, use and dispose of plastics more responsibly. Our understanding of solutions goes little beyond coarse categories identified in the 1970s – Reduce, Re-use, Recycle. In short, we lack granular evidence on what to reduce, and what to re-design for re-use or circularity; as well as evidence on the points along the supply chain where interventions would be most effective. Which actions are the responsibility of the consumer versus the producer, who will bear the cost and how can policy help influence outcomes? **We need to act swiftly, but our extensive research shows that doing so in the absence of evidence could make matters worse.**

RESEARCH FINDINGS

- Our **microplastics in cosmetics** research showed a single product could contain around 3 million plastic particles. This informed UK legislation to prohibit use and demonstrates the importance of measures focused on Extended Producer Responsibility.
- Our **biodegradable and compostable plastics** research showed considerable variability among polymers and environments, illustrating the critical importance of independent testing, standards and labelling.
- Our **textiles** research showed that hundreds of thousands of fibres are shed during laundering and while wearing garments, and that some devices to capture fibres in washing machines were ineffective. This points to the need for better design compared to downstream interventions.
- Our research on the **Highways Network** showed settling ponds and wetlands effectively intercepted **tyre particles** transported by rainfall. However, substantial quantities of tyre particles still pass directly to water courses or the atmosphere indicating improved tyre design and changes in driver behaviour may offer more holistic solutions.
- Our research showed **mechanical clean-up devices** to be ineffective and to entrap one marine organism for every four items of litter caught, illustrating the potential for environmental risks if interventions are not properly evaluated.

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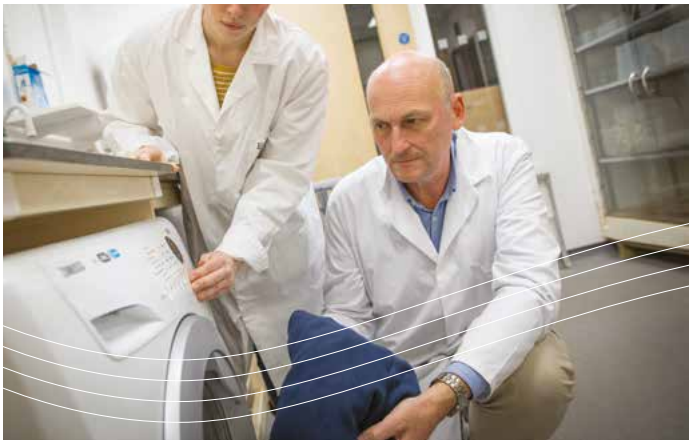
KEY POINTS

1. **The environmental issue of plastic pollution and broad categories of solutions are well defined.**
2. **Progress is hindered by a lack of evidence on the efficacy of specific interventions, variability according to location and the trade-offs among interventions.**
3. **UK Research and Innovation has the potential to address these challenges and to deliver environmental, societal and economic benefits, but delivery will require transdisciplinary approaches.**

Plastic debris contaminates the natural world with associated impacts on economies, wildlife, human health and wellbeing.



POLICY IMPLICATIONS

Our work indicates **the importance of taking a whole systems perspective** guided by robust independent evidence to tackle this environmental challenge at a national (UK Plastics Pact) and international (UN Plastic Pollution Treaty) level. In the absence of such, there is a real risk that interventions will be ineffective or even lead to unintended negative consequences.

We need to act swiftly, but our extensive research shows that doing so in the absence of evidence could make matters worse.

POLICY RECOMMENDATIONS

- Upstream interventions at the design stage are likely to be most effective.
- Set downstream interventions in context of the waste hierarchy.
- Some innovations work locally or nationally, others require international collaboration.
- Independent evidence is critical to achieve maximum benefit and to prevent unintended negative consequences.
- As a member state request that UNEP establish a permanent independent scientific advisory body to the UN treaty.

NEXT STEPS

- **Synthesize current evidence to guide interventions and to identify knowledge gaps that require additional scientific evidence.**
- **Develop international networks to maximise research synergy and evaluate solutions in differing locations.**
- **Work with UN and Member States to ensure independent research evidence informs the UN Plastic Pollution Treaty.**

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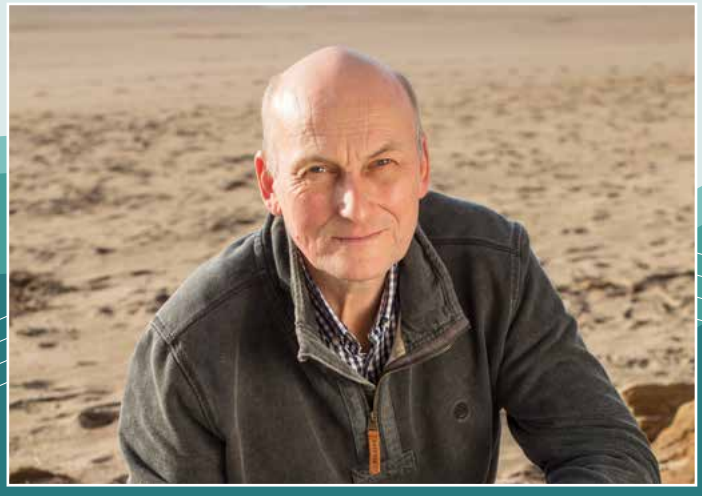
POLICY QUESTIONS

- There is considerable opportunity for the UK to guide the way towards more responsible use of plastics, building on our reputation and providing leadership at an international level.
- Which actions will be effective at a national scale and where are international agreements essential?
- Can we leverage commercial opportunity by developing effective, reliable approaches and innovations?
- Can the UK help establish a permanent independent scientific advisory body to guide the UN treaty?



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The University of Plymouth is renowned for internationally leading education, research and innovation; it has a mission to Advance Knowledge and Transform Lives. A three-time winner of the Queen's Anniversary Prize, most recently in respect of pioneering research on microplastic pollution in the ocean, the University continues to drive global action in marine and maritime, sustainability, health technologies and climate.

Find out more about our researchers and their work: plymouth.ac.uk/research/marine-litter