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Understanding microplastic routes from the source to the ocean by exploring their transport by the Mondego river, Portugal

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Abstract

The exponential growth of plastic production associated with inefficient waste management is changing the marine ecosystem and has the potential to impact life on Earth. Breakdown of plastic and direct inputs of pellets, shavings and microbeads result in microplastics (MP) dispersion in the environment, and rivers are the main routes for MP transport to the ocean. Depending on their density, they have the capacity to remain suspended in the water surface and water column, while the effects of weathering and biofouling can transport them to the seabed and be ingested by pelagic and benthic organisms, being transferred along the food web. Effective strategies must be implemented to flatten the pollution curve.

Samples of water and sediments were collected along the Mondego river and estuary in strategic points according to possible inputs from plastic producers, recyclers and WWTP, in different seasons to understand the distribution of different MP. Different types of MP were found, displaying distinctive colours, shapes, sizes, and chemical composition. The abundances and the type of MP vary throughout the year and according to the selected sampling locations, and data so far suggest that transport of MP from the river to the sea occurs mostly in winter, as expected.

Field data will be integrated in a transport model for the river, coupled with a coastal drift model to predict transport and target hot spots from the Mondego river to the estuary and the sea. With this knowledge, strategies are being studied and implemented in collaboration with the stakeholders who have an awareness and willingness to change, boosting the collaborative and effective strategies to mitigate this environmental problem, enabling industries to improve their safety and sustainability in our Blue Society.

Keywords

Microplastic routes, River Sea, Mitigation strategies, Sustainability