

Exploring solutions for plastic pollution: detecting, collecting, and preventing unwanted debris in the Scheldt River

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Riverine systems are pathways between terrestrial and marine ecosystems, transporting anthropogenic chemicals and pollutants, including plastic items and microplastics, from agricultural fields or cities to the coast and open sea. Plastic pollution, including items from nano to macro size range, has been detected in all Earth's ecosystems with observed negative socio-economic and environmental impacts. Therefore, there is a pressing demand for effective and innovative approaches to detect the number and mass of plastic transported by or accumulated in the rivers, and to find solutions to remove or prevent the litter input into these systems. The Scheldt River is an important water course that flows over France, Belgium, and the Netherlands, with its estuary at the North Sea. Through its journey until the sea, the Scheldt flows through urban clusters, industrial and agricultural areas, and is used for navigation, having several harbors, including the port of Antwerp- Bruges (Europe's largest petrochemical industrial cluster and Europe's second largest port), and it is known to have several areas of plastic litter accumulation (litter hotspots). Because of this, the Scheldt River was selected as one of six European rivers that are currently use cases in the Horizon Europe project Innovative Solutions for Plastic Free European Rivers (INSPIRE). With this specific use case, we aim to test innovative detection methodologies and collection technologies for macro-, meso-, and microlitter at an urban and industrial area in Temse (upstream from Antwerp) and in existing infrastructure in the port of Antwerp, in Doel. To achieve our goals, three different cleanup technologies will be tested in two selected locations to remove litter from the water surface/column and from the sediments at the riverbed. Citizen science activities will complement the technologies removal action, via cleanup events, but also by promoting community engagement and dissemination activities aimed at increasing awareness and the prevention of the consumption of single-use products and their incorrect disposal at their end-of-life. Local stakeholders, such as local retailers, authorities, schools, industries, among others, will be involved in the use case activities, enabling them to interact and get informed about alternative practices (e.g., use of biodegradable packaging and reduction of littering behavior). To assess the effectiveness and impact of the litter removal technologies and behavior change actions, the plastic pollution state of the Scheldt is going to be observed during the course of the project, by a combination of more well- established plastic collection methodologies and technological observations that use artificial intelligence (AI) models to identify and quantify floating litter. The data collected will also be used to optimize the cleanup technologies, with the assistance of modelling tools. The cost-benefit and sustainability of the approach selected for the Scheldt will be evaluated and compared with the results obtained from the other five INSPIRE use cases. This will enable the development of improved action plans, and ultimately a modular master plan for litter mitigation actions applicable to riverine areas in Europe.

Keywords

Plastic Pollution; Microplastics; Water; Sediments; Sampling; Citizen Science; Prevention