PLASTFLOW - How much plastic flows into the North Sea? Quantifying plastic fluxes and identifying plastic hotspots in the Scheldt Estuary in Belgium

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Previous studies have reported high and spatially variable microplastic concentrations in the Scheldt River, averaging 42.9±70.6 particles/m³. The Flemish estuary of the Scheldt River has been identified as a potential major sink for plastic pollution (Everaert *et al.*, 2022). Within the PLASTFLOW project, we aim to assess litter levels and plastic fluxes in the Scheldt estuary, Belgium, throughout 2024-2025. The project focuses on quantifying seasonal variations, refining computational models of plastic flux, and providing clear insights into the amount of plastic flowing into the sea for development-informed decisions. These efforts align with Objective 9 of the Flemish Marine Litter Action Plan, which targets a 75% reduction in plastic inflow to marine environments by 2025.

Sampling is taking place at six selected locations along the Scheldt River, based on the results of a previous baseline study (Everaert *et al.*, 2022). To comprehensively assess plastic pollution within the Scheldt estuary, we are conducting sampling across two compartments, water and sediment, at different depths. In this way, the different behaviours and flux associated with the different polymer types of plastic litter and their associated densities are considered. To sample surface water, net-based sampling methods are used, while plastic pollution throughout the water column is assessed using specialised suspension and bedload samplers. Sediment is sampled at the riverbed using a Van Veen grab, while riverbank samples are acquired using a quadrant-based sampling approach along set transects, as well as through drone analysis.The combination of these innovative sampling techniques enables us to capture a representative snapshot of the distribution of macro-, meso-, and microlitter present.

During the planned campaigns within PLASTFLOW, three types of follow-up measurements are being acquired, each time during spring, summer, autumn, and winter: tidal cycle measurements, to assess and quantify the tidal movement of plastic particles along the Scheldt River; spot sampling measurements; and hotspot measurements, to assess long-term trends in microplastic deposition and identify key environmental parameters of plastic retention and accumulation.

Preliminary results point out Antwerp as a hotspot for microplastics in both water and sediment (286-615 plastics/m³), pellets (2822-6611 pellets/m³), mesoplastics (56-1238 plastics/m³), and macroplastics (23-181 plastics/m³). While areas further upstream appear to be hotspots for microplastics as well (151-778 plastics/m³ at Wintam and 275 plastics/m³ at Temse), meso- and macroplastic as well as pellet abundance on the riverbanks in both these areas was low (0-90 pellets/m³, 1-20 mesoplastics/m³, and 2-7 macroplastics/m³).

All acquired data will be open access and FAIR, and used to produce computational models that will be applied to determine the transport of plastic particles along the Scheldt estuary. By integrating these results into computational models, the project will enhance predictions of plastic flux and accumulation, supporting updates to monitoring frameworks and aligning with the EU Green Deal's Zero Pollution Action Plan, which aims to improve water quality by reducing marine litter and plastic waste by 50% and decreasing microplastics entering the environment by 30% (Devriese *et al.*, 2023).

References

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Keywords

Plastic Pollution; Scheldt Estuary; Plastic Flux; Plastic Hotspots