

### Short Description

**Project Coordinator: Dr. Andy Booth, SINTEF, Materials and Chemistry Environmental Technology Sector, Trondheim**

The PLASTOX project will investigate the ingestion, food-web transfer, and ecotoxicological impact of microplastics, together with the persistent organic pollutants (POPs), metals and plastic additive chemicals associated with them, on key European marine species and ecosystems. It will also study the temporal dynamics of microplastics colonisation by microbial communities in the field and the influence of microbial biofilms on ingestion rates and POP toxicity. The influence of microplastics physicochemical properties (e.g. size, shape, surface area and composition) on these processes will be evaluated. PLASTOX will combine field-based observations, laboratory tests and mesocosm experiments, and manipulative field experiments to study the ecological effects of microplastics. PLASTOX aims to bridge the current gap between laboratory assessment using commercially available feedstock microplastics and the additive-loaded and degrading microplastics which dominate the marine environment. Macro-sized plastic debris collected from the marine environment will be used to generate microplastics derived from real marine litter.

These 'stock' materials will be homogenized, fully characterized for physicochemical properties and POP/metal load, and distributed to partners for use in environmental fate and effects studies. This will provide a common reference material for all project partners, allowing improved comparison of data generated at different laboratories.

PLASTOX seeks to generate a clearer understanding of the adsorption and desorption of organic and inorganic pollutants to microplastics using a range of common POP and metal contaminants, as well as common plastic additives. Comprehensive studies will be conducted to understand how this adsorption/desorption behavior varies between different contaminants, and to identify which physicochemical properties are most influential. Studies will be conducted using pristine and marine litter-derived microplastics, employing optimised laboratory and long-

term field experiments at different stations in a wide range of European marine environments (Mediterranean, Adriatic, North, and Baltic Seas; the Atlantic in Portugal, Ireland and Norway) and in wastewater treatment plant effluents. As an innovative approach, compound-specific stable isotope analysis will be applied to understand the fate and transport of pollutants on microplastics. For microplastics extracted from 'radiometric dated sediments', POP and metal levels on older plastics will be determined providing the first estimates of the levels of pollutants gathered on microplastics over long time spans (10-30 years).

PLASTOX will investigate uptake through ingestion and other routes following controlled exposures. The potential for microplastic accumulation in tissues of marine organisms through transport across the gut and cell boundaries will be studied and attempts made to quantify microplastics accumulation using state of the art analytical approaches. microplastics accumulation will be linked to the physicochemical properties of microplastics, effects of microbial communities, and comparisons drawn between different species. The acute and sublethal ecotoxicological effects of microplastics will be assessed on marine organisms from phyto- and zooplankton to (shell)fish and seabirds, representative of the full range of also economically important marine living resources in the EU, using an integrated battery of biomarkers at different levels of biological organization. Using data and competence generated in these studies, a more detailed understanding of the potential for microplastics transfer between trophic levels, and the subsequent impacts this may have, will be obtained. Finally, PLASTOX will culminate in a series of experiments bringing together the knowledge generated about microplastics and POPs/metals to study the combined fate and effects of these marine contaminants in food web studies. The knowledge generated will be summarized in a guidance document and serve as a strong evidence base for development of future legislation and remedial efforts.

# Consortium

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