

# RESPONSE

## Towards a Risk-Based Assessment of Microplastic Pollution in Marine Ecosystems

**DURATION**  
1/04/2020 – 31/03/2023

**BUDGET**  
250 000 €

### PROJECT DESCRIPTION

#### Context

Microplastic particles (MPs) are present across the globe, from polar regions to the equator, from intertidal zones to abyssal sediments. However, attempts to quantify oceanic plastics are often controversial and difficult to compare due to the lack of standardized sampling methodologies, as well as differences in normalization units and expression of data. In particular, the lowest particle sizes that are routinely sampled are those with dimensions in the order of 300 microns: thus there is a huge data gap on the distribution of smaller size range of MPs and all nanoplastics (NPs). This situation is of concern because smaller particles are inherently more bioavailable than larger ones. Accordingly, there is an urgent need to develop methods to characterise and quantify MPs and NPs, and to understand their environmental fate and potential ecotoxicity.

#### General objectives and underlying research questions

- To gain new knowledge on the spatial and temporal distribution of MPs and NPs in marine systems by investigating causal relationships between their occurrence along the water column, sediments and biota. Our mechanistic approach will explore the significance of biological factors (e.g. reproductive cycle, food availability, feeding strategy and habitat) and environmental variations (human impact, hydrodynamic conditions) in modulating the bioavailability and effects of MPs over a range of spatial scales and temporal scales.
- To develop a quantitative Weight of Evidence (WOE) approach for assessing the potential impact of MPs in the marine environment. This strategy will provide a means for integrating the large and growing body of heterogeneous data on MPs in a way that is transparent to non-expert stakeholders.

#### Methodology

RESPONSE will combine field sampling with modelling, laboratory and mesocosm studies to systematically characterise the biological fate and effects of MPs and NPs. The field studies will be conducted over a wide geographic area, including the Mediterranean, Atlantic Ocean, North Sea and Baltic sea; sampling will be performed in different time periods to evaluate seasonal difference according to variations in both environmental factors and human pressures. The approach will include characterization of ecological thresholds for specific characteristics of MPs that can modulate their ingestion and toxicity to marine organisms, as well as investigation of the ecotoxicological hazard of still unexplored particles such as NPs and biodegradable polymers. We will also pay attention to chronic effects of MPs, their interactions with other stressors, and their long-term consequences on different ecosystem descriptors or services, which are less understood aspects of the ecological impact of MPs. The results obtained from the various lines of evidence will be integrated and summarized in a WoE model that formulates hazard indices based on the biological relevance of the data. The contributing factors will be weighted according to the relevance of the endpoints, the associated threshold values, and the magnitude of observed effects.



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## Potential impact

RESPONSE will improve public awareness on the ecological risk of MPs and facilitate effective knowledge and information exchange between project partners and expert and non-expert stakeholders. The WoE software will be a sound support tool for formulation of monitoring guidelines and environmental policies.

## Expected final research results

RESPONSE will generate new knowledge on the spatial and temporal distribution of MPs and NPs in marine systems and will identify causal relationships between their occurrence along the water column, sediments and biota. Procedures will be developed to characterise and quantify small MPs and NPs in water, sediments, and biota. A Weight of Evidence strategy and software tool will be made available for assessing the potential impact of MPs in the marine environment. The results will be widely disseminated by a range of methods including publications in peer-reviewed scientific journals, presentations at conferences, press releases, and information on the project website.

## CONTACT INFORMATION

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