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# Toward a risk-based assessment of microplastic pollution in marine ecosystems:

# RESPONSE

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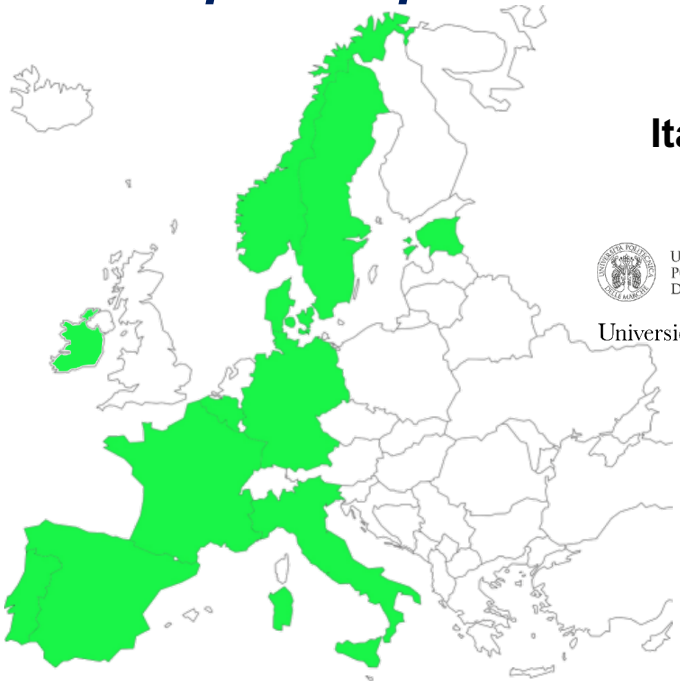
# RESPONSE

## *Toward a risk-based assessment of microplastic pollution in marine ecosystems*



**14 Institutions from 11 European countries:**
**Italy, Belgium, Denmark, Estonia, France, Germany, Ireland, Norway, Portugal, Spain and Sweden**

ECOLOGICAL ASPECTS OF MICROPLASTICS

EPHEMARE
ECOTOXICOLOGICAL EFFECTS OF MICROPLASTICS IN MARINE ECOSYSTEMS

PLASTOX

BASEMAN
MICROPLASTICS ANALYSES IN EUROPEAN WATERS

WEATHER-MIC

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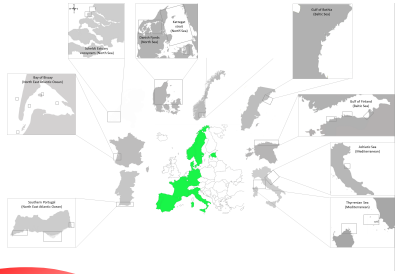
# General aims of RESPONSE

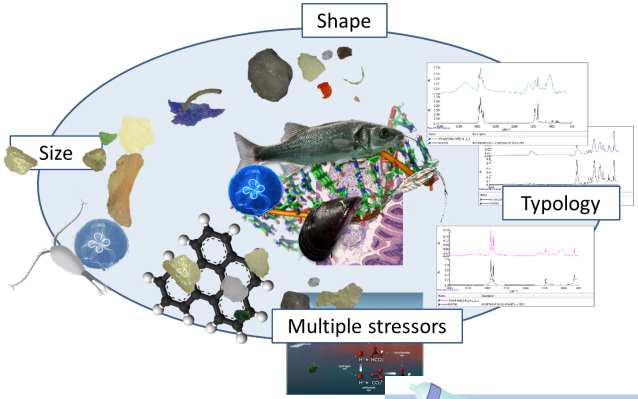
**Spatial and temporal distribution of MPs and NPs**
**WP1**

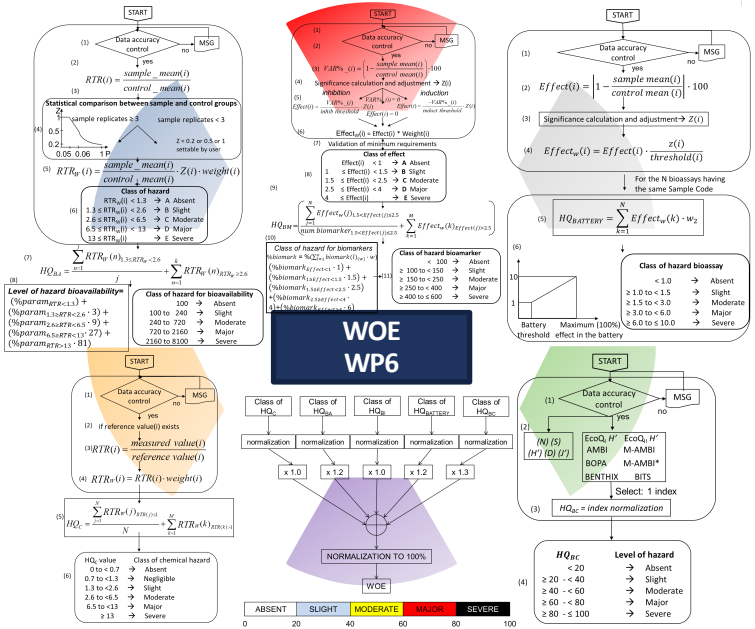


**Ingestion/Excretion /Translocation**
**WP2**

**Molecular/Cellular Biomarker**
**WP3**

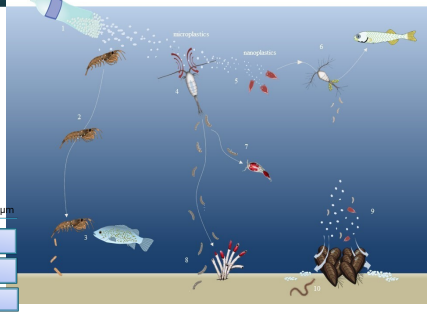
**Organism Toxicity**
**WP4**

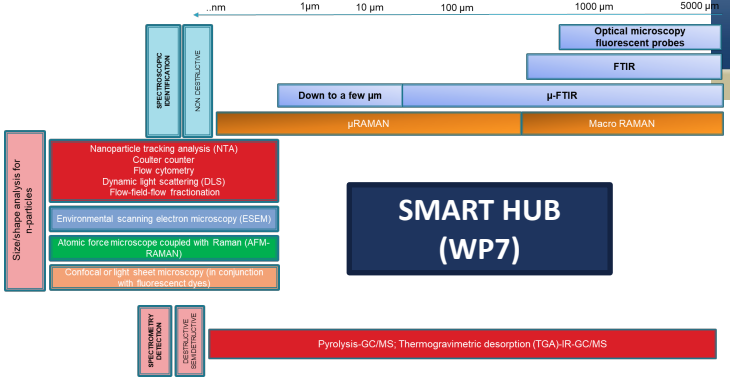



**WOE**
**WP6**

**Ecology**
**WP5**






**SMART HUB**
**(WP7)**

**Communication and stakeholder engagement WP8**

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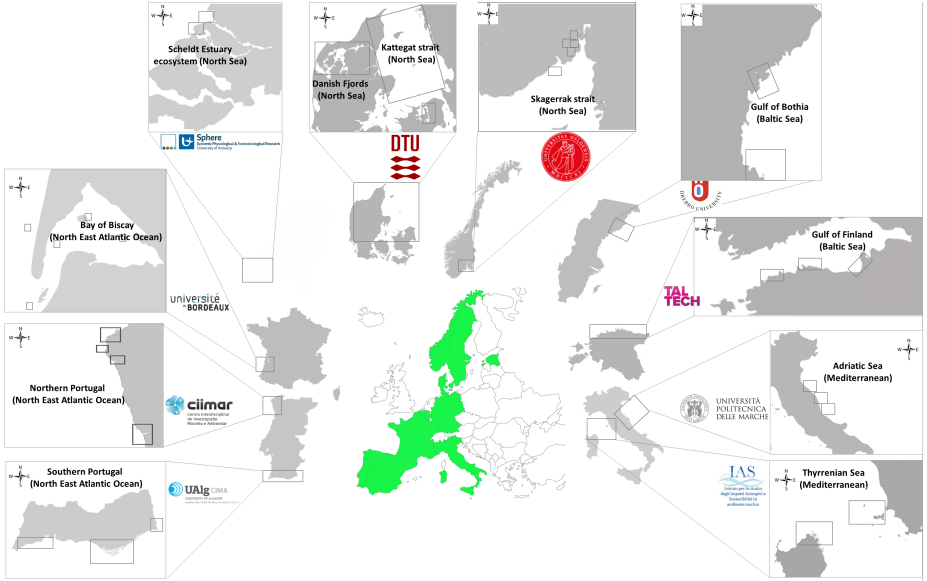
# RESPONSE- WP1
## Involved partners and field activities




***Validation of ecologically relevant strategies for assessing the distribution pathway of MPs in marine ecosystems and their biological impact:***

***General aims/activities:***

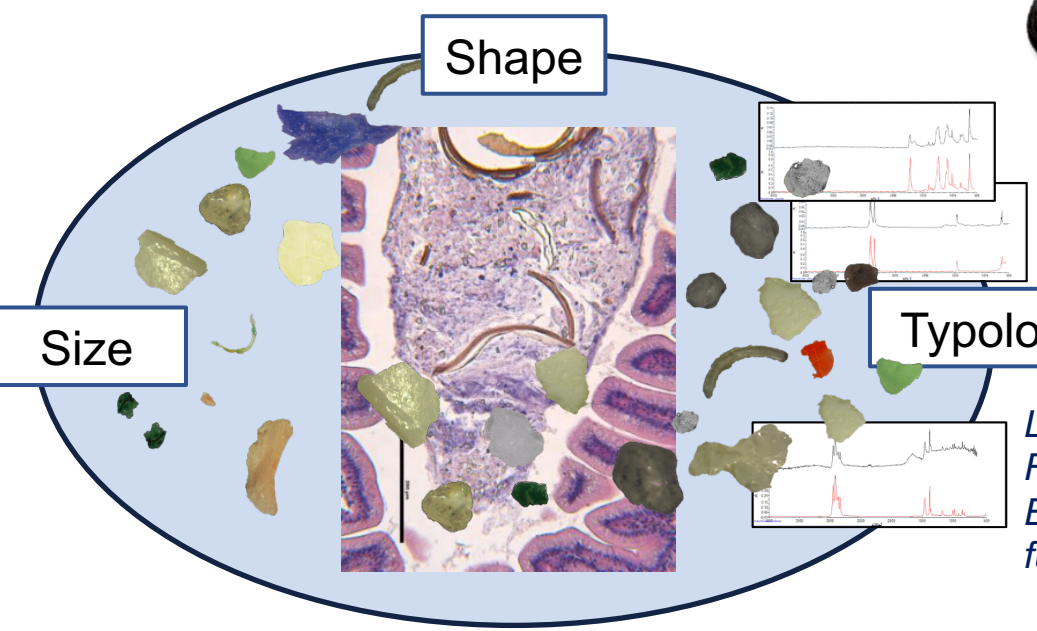
*Samplings of **seawater and sediments**: novel insights on vertical distribution, focusing on sizes and shapes of biological relevance. Adaptation of collection strategies.*

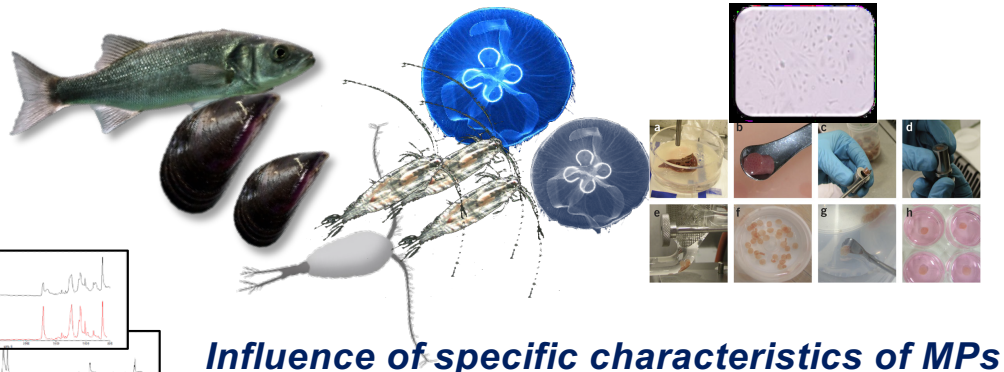
***Oceanographic models** and parametrization of vertical processes*

***Key model species** in different sites and periods to evaluate seasonal differences according to variations of biological, environmental factors and human pressures.*

*Field data will be the basis to extrapolate **weights and ecological thresholds for different characteristics and typologies of MPs in the environment**, oriented to define an **integrated value for expressing MPs** in abiotic matrices and biota for their final elaboration into the WOE model.*

# RESPONSE-WP2
## Ingestion/Excretion/Translocation



***Influence of specific characteristics of MPs on key biological mechanisms***

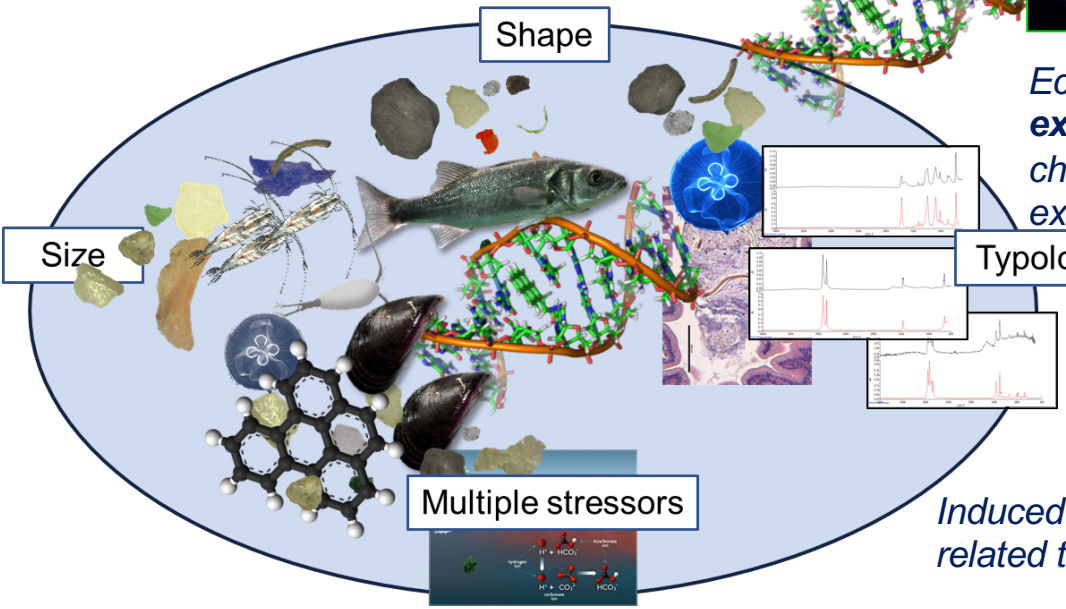
*Key bioindicator species, tissue slices, cells and cell cultures*

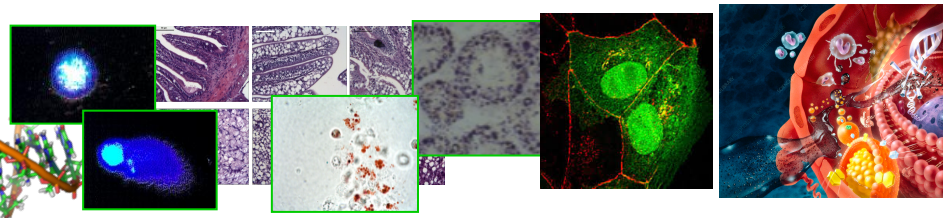
*Laboratory and mesocosm experiments*
*Field-collected (micronized) plastic particles*
*Biodegradable polymers and NPs as examples of future challenges*

*Species sensitivity distributions (SSDs) and multispecies uptake-accumulation model for different types of plastics and their sizes.*

*Results will contribute to defining **weights and ecological thresholds** for different characteristics of plastics (e.g. sizes and shapes), useful for the calibration of the WOE model and for elaborating the biological significance of data obtained in WP1*

# RESPONSE-WP3
## Biomarker-based approach



*Ecological relevance through appropriate selection of **experimental conditions**, typology of **tested MPs**, choice of **analyzed biomarkers** and inclusion of exposures to **multiple stressors**.*

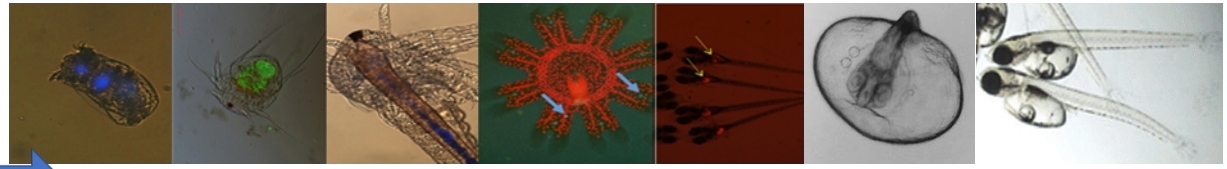
*Considering the **lack of acute toxicity** of MPs, this WP will mostly investigate the onset of **chronic and subtle effects***

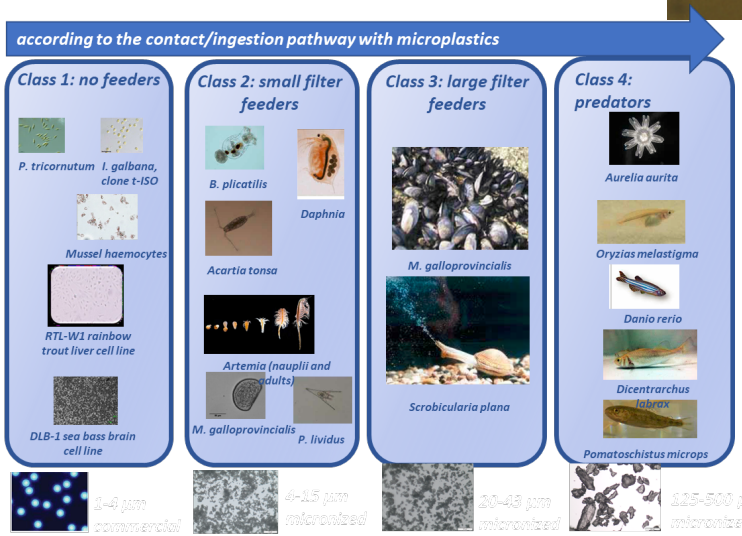
*Induced sensitivity to **secondary stressors** including those related to **climate change** or anthropogenic **pollution***

*Biomarkers related to **homeostatic physiological** processes and **responsiveness to environmental stress** (immune system, antioxidant and oxidative stress pathway, cellular damage and energy metabolism)*

***Integrated elaboration** procedure to summarize **hazard index** based on the toxicological relevance of measured endpoints and their variations compared to thresholds specific for each biomarker*

# RESPONSE-WP4
# Organism toxicity






***Chronic effects of MPs at the organism level to validate the correct use of a battery of bioassays***

*Previous data from Ephemare project on a large selection of ecotoxicological bioassays spanning from non-feeding organisms up to predators*

*Leachates of field-collected plastics (to extrapolate potential long-term hazards), Biodegradable polymers and NPs as an emerging challenge*

*Effect-directed analyses (EDA), like gene reporter assays*

***Results** of bioassays will not be evaluated as individual tests, but **elaborated as "integrated batteries"***

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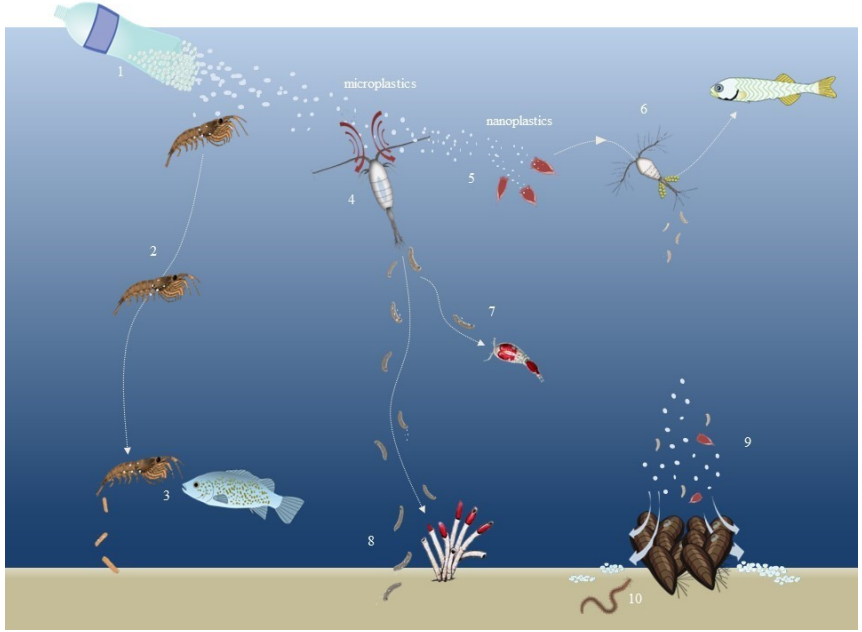
# RESPONSE-WP5
## Ecological structure and functioning




***Mesocosm and field manipulative experiments to identify most relevant MPs and NPs exposure scenarios***

***Role of microbial community, zooplankton and zoobenthos in the environmental fate of MPs and NPs:***

*-the "biological plastic pump" hypothesis*

*-trophic transfer in food webs;*

*-effects on meroplankton and benthic recruitment;*

*-large filter-feeding bivalves, biodeposition and potential effects on benthic communities;*

*-validation of ecological indices describing the potential impact of MPs and NPs and conversion into a mathematical tool for the WOE model*

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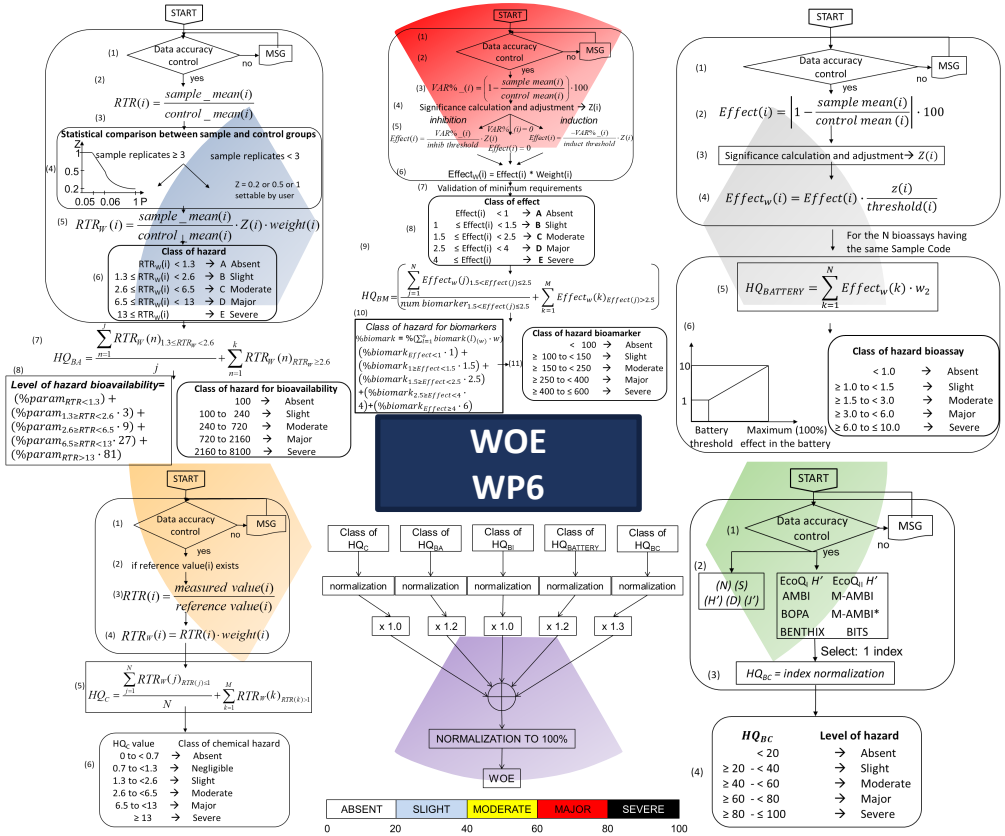
# RESPONSE-WP6
# Weight Of Evidence (WOE) Model




***Weighted criteria for elaboration of individual Lines Of Evidence (LOEs)***

***LOE1:*** *Occurrence in environmental matrices*

***LOE2:*** *Bioavailability*

***LOE3:*** *Biological effects (early molecular-cellular)*

***LOE4:*** *Biological effects (organism level)*

***LOE5:*** *Ecological effects*

***WOE integration***

*Thresholds defined on the basis of occurrence, or biological responsiveness*

*Weights will be given to specific characteristics of MPs (size, shape, typology), and to biological or ecological effects*

***Software development***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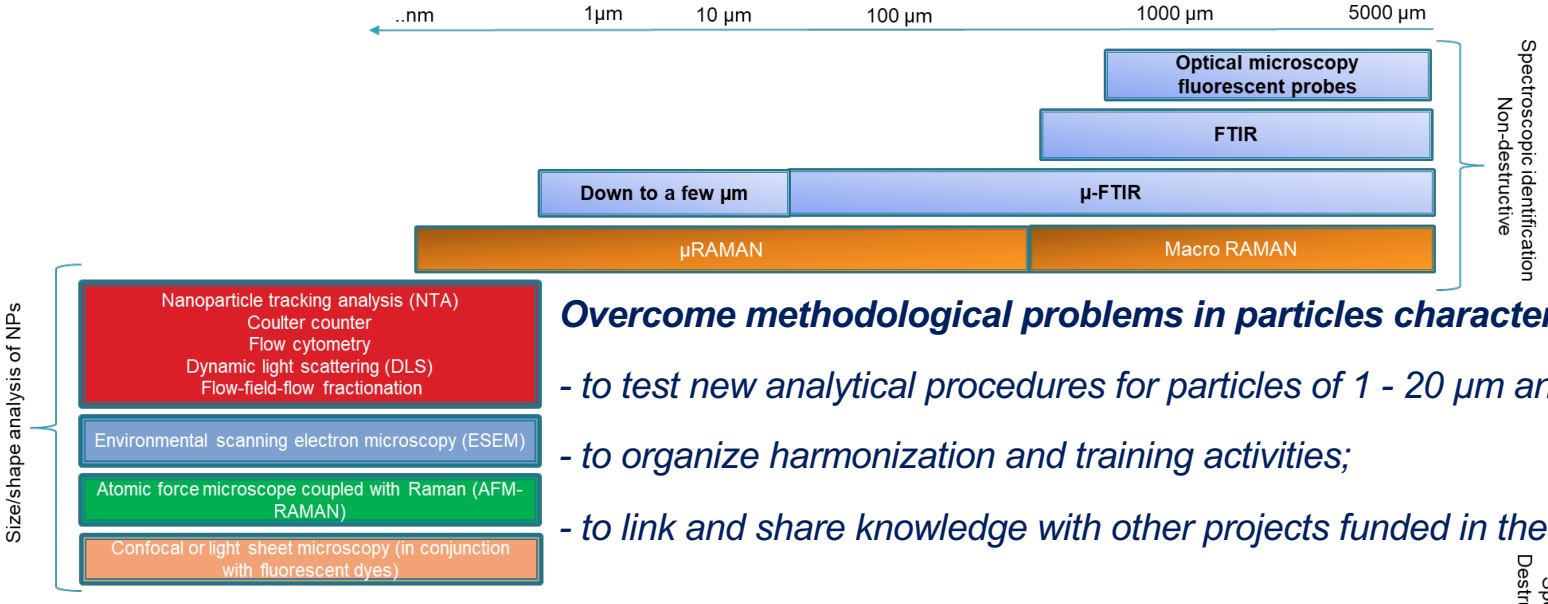
# RESPONSE-WP7
## Smart Hub of analytical facilities

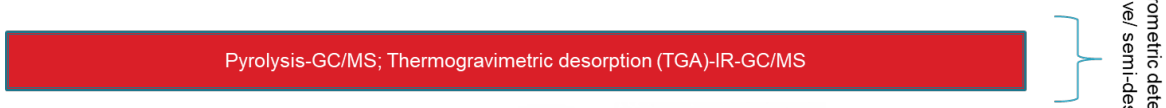



***Overcome methodological problems in particles characterization***

*- to test new analytical procedures for particles of 1 - 20 µm and NPs;*

*- to organize harmonization and training activities;*

*- to link and share knowledge with other projects funded in the current JPI call*

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# RESPONSE-WP8: Communication and Stakeholder Engagement


*-to use **various targeted tools** to communicate and disseminate project activities, and outcomes to a range of audiences;*

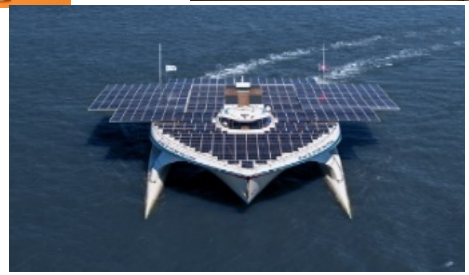
*-to **raise awareness** on the ecological relevance of MPs and NPs in marine environment;*

*-to **provide advice** for MPs and NPs monitoring protocols (MSFD);*

*-to ensure **scientifically correct communication** of the project;*

*-to **engage key stakeholders** using a collaborative approach within the project.*

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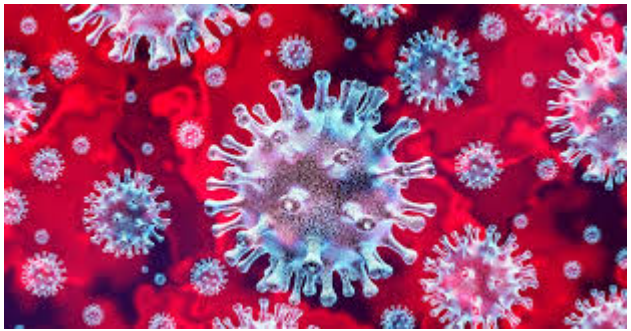
# RESPONSE and Covid-19

*Decision for funding and proposal adjustments: January 21*

*Revised proposal for Funding Agencies and reviewers, resubmitted: February 12*

*Final Acceptance: March 04 with expected start on April 01*



*March 09: Italy declares national lockdown due to Covid-19*

*The Consortium has agreed to postpone the beginning of activities to September 1*

*First kick-off virtual meeting of RESPONSE in early June*

*Most of the field activities have been re-scheduled: no major problems are expected due to delayed start of the Project*

# A special thank to JPI Oceans and to National Funding Agencies

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Opening new horizons

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THANK YOU

Francesco Regoli

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