

NEWSTHEPS

New Sampling Tools for Heritage & Emerging Pollutants to facilitate GES assessment in the Marine Environment

DURATION
 15/12/2014 – 15/03/2019

BUDGET
 1.200.000 €

PROJECT DESCRIPTION

The NEWSTHEPS project will develop innovative approaches and novel practical techniques that address the current fundamental scientific and methodological issues related to the implementation of Good Environmental Status (GES) for Descriptor 8 of the Marine Strategy Framework Directive in national and European waters.

In this research project, novel and integrated passive sampler (PS)-based approaches (modelling and measurements) will be developed for both chemical exposure (monitoring) and biological effect assessment (passive dosing). Through the use of a broader array of PS techniques, applicable in a wide polarity range, the project will focus on the quantitation of an extended set of priority and emerging organic micropollutants and metals (targeted approach). Next to that, untargeted analysis with high-resolution mass spectrometry will be performed to develop qualitative screening approaches able to detect trace levels of a virtually unlimited number of known (suspect) and possibly unknown contaminants. For a selection of compounds, both the total concentration and labile fraction (i.e. bioavailable) will be determined.

Additionally, to trace the Suspended Particulate Matter (SPM) towards its origin, carbon ($^{12}\text{C}/^{13}\text{C}$) and nitrogen ($^{14}\text{N}/^{15}\text{N}$) stable isotope ratios will be measured, since organic matter from marine and terrestrial origin has a different isotopic C and sometimes N signature. In some cases, the sources of the organic matter present in the marine environment might be identified. In addition, modelling techniques will be of great support.

This novel and integrated approach allows (1) a better measurement of contamination levels in the marine environment, and (2) to assess the ecotoxicity of multi-component mixtures including possible synergistic and cumulative effects and compound profiling or identification. The development and validation of an integrated model to assess the environmental status of the Belgian coastal zone by predicting accumulation, trophic transfer and effects of chemicals in this specific (local) ecosystem are central issues in this project.

The CALUX assays are very useful for the screening of pollutant groups, like dioxins (AhR receptor) and estrogens (ER receptor). The extracts from the passive samplers for organic pollutants can be analysed by CALUX assays. Based upon measured environmental concentrations, toxicity testing of compounds and mixtures in environmentally realistic concentration will be performed.

Finally, hydrodynamic and sediment transport models will be adapted to simulate the transport of the selected pollutants. The measurement of stable isotope ratios in SPM will form a basis for calibrating the model. This approach must allow taking appropriate measures to identified pollution sources in case of exceeding the Environmental Quality Standard (EQS). As the Belgian Part of the North Sea has been polluted for many years, one of the main challenges will be the proposal of appropriate measures for problematic compounds. Since those measures will be very costly, it is imperative they are cost-effective.



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The project offers a unique combination of diverse sampling techniques coupled to a variety of state-of-the-art analytical techniques for a nearly full coverage of expected type of target compounds (metals, polar and non-polar organics), coupled to a number of evaluation criteria (toxicity of individual and mixed compounds, CALUX assay, stable C and N signatures), all to be processed in a comprehensive model. Ultimately, this integrated approach will lead to the development of **novel procedures for comprehensive environmental monitoring and risk assessment of a broad set of both priority and emerging contaminants in the marine environment** allowing an **integrated, more efficient, cost-effective and scientifically relevant way to assess GES**.

The project will produce concentration data of priority and emerging contaminants to be made available at the national and international level. In this sense, the project will deliver for the first time such a comprehensive and coherent dataset, from which other disciplines dealing with the marine environment will benefit greatly. The results will fill up an important gap in knowledge on integrated monitoring in the North Sea.

Scientific results will be valorised and disseminated by:

- A **project website** serving different target groups, both as an information source for specific end-users and the broad scientific community, but also the general public providing objective and scientifically grounded information on issues like micropollutants and related eco-toxicological risks.
- **Publications** in the international literature, especially peer reviewed articles.
- **PhDs**.
- **Online metadata database** providing an overview of project activities, to be updated at regular intervals.
- **Online project database** granting access to data at different levels for different target groups. Partners can access all project data in a password-protected area, other groups get access according to project data policy.
- Yearly data **transfer of analysis and measurement data** to Belgian Marine Data Centre (BMDC), that is connected to international databases.
- **Dissemination of results to specialised working groups** involved with management of the marine environment e.g. OSPAR-MIME, MCWG, WGBEC and **advice** on integrated assessment of the marine environment at the same level.
- **Presentation of the results** during international scientific symposia and similar fora.
- **Outreach** by articles suitable for the wide audience.



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