

Integrated risk assessment and monitoring of micropollutants in the Belgian coastal zone (INRAM)

Duration of the project: Phase 1: 15/12/2006 – 31/01/2009
Phase 2: 01/02/2009 – 31/01/2011

Budget Phase 1: 522.485 €

Keywords: Micropollutants; ecological risk assessment; human health effects; foodchain transfer; monitoring tools; integrated coastal zone management.

Context

Marine ecosystems, fundamental components of the biosphere, receive inputs of hazardous substances through riverine inputs, direct discharges as well as by atmospheric deposition. As such, marine ecosystems are the ultimate repository for a cocktail of chemicals that may have effects on the organisms living in these systems. Little is known about the transfer of these chemicals to and their effects on the different components of coastal/marine ecosystems. This hampers an ecologically sound risk assessment and/or derivation of science-based environmental quality criteria for these compounds. Thus, in the framework of future-oriented policy measures at the national and European level, there is an urgent need for an integrated and focussed approach to assess the impact of hazardous substances on the health of the marine environment.

Project description

Objectives

The major objectives of INRAM are to:

- (1) study of the environmental concentrations of established priority and emerging pollutants and their transfer to coastal waters;
- (2) apply a unique combination of novel field and laboratory ecotoxicological and chemical techniques to determine both effects and food chain transfer of these chemicals;
- (3) establish the relationship between local occurrence of hazardous compounds, ecosystem health and potential human health effects, through the use of consumer organisms as test/monitoring species;
- (4) develop and evaluate a framework and toolbox for monitoring the chemical anthropogenic pressures on coastal ecosystems and commercial marine products.

Methodology

The proposed project can be divided into five different research tasks:

Task I: Exposure assessment – identification, quantification and geographical distribution of micropollutants in Belgian coastal waters

To assess the occurrence of the selected chemicals along the Belgian coast, 9 sampling stations will be selected of which 3 located at least 5 kilometres from the coast (controls). Nine stations in the three Belgian harbours and in the Scheldt estuary will serve to assess the occurrence and contribution of the selected chemicals released by the harbours and the Scheldt, to pollution along the Belgian coast. On each sampling date, water, sediment and biota will be collected. In addition, the use of passive samplers will be further developed and evaluate

Task II: Effect and bioaccumulation assessment – linking multi-contaminant exposure to ecologically relevant effects on selected resident marine models species

Various laboratory and field ecotoxicological studies will be performed with several ecologically and/or economically important species. Novel assays and test endpoints will be combined with the application of passive samplers. Single-compounds tests, relevant literature and QSARs will be used to attempt to explain the observed effects. Based on the results of the exploratory phase, a final battery of 4 assays will be selected.

Task III: Ecological monitoring

This phase involves the development and assessment of ecological endpoints for evaluating changes in ecosystem health. This will include new research into the in-field ecological performance of species used in the laboratory and field studies in addition to conventional monitoring and evaluation of the ecological status of the Belgian coastal waters.

Task IV: Risk assessment

Application of risk assessment techniques will allow to assess the impact of the chemicals on the marine systems. Additionally through bioaccumulation measurements and biomagnification calculations the potential effects of the detected hazardous chemicals on two new protection goals, namely man and resident tern populations, will be evaluated.

Task V: Development of management tools

In this phase, integrated risk assessment procedures will be developed for the routine assessment of the impact of hazardous chemical present in Belgian coastal water on ecosystem health and man.

Interaction between the different partners

Within the project, the project partners strive to collaborate as much as possible for the major tasks. Each task has a team leader and one or several partners that are responsible for the research.

General coordination will be done by UG-LMAE, who will also be the central link between the project and the outside world. MUMM and VLIZ will be responsible for sampling and field deployment and will provide cruise time on their research vessels. MUMM, UG-LCA and the Flemish Environment Agency (FEA) will collaborate on the chemical analysis. The ecological monitoring will be coordinated by UG-LMB in close collaboration with UG-LMAE. The in situ assays, laboratory studies and the integrated risk assessment will be the responsibility of UG-LMAE, the latter in collaboration with subcontractor EURAS. Collection and storage of the environmental data will be done by VLIZ, who will also be responsible for reporting the data to IDOD. Final integration of the project which includes the performance of the integrated risk assessment and development of assessment/monitoring procedures, will be done by EURAS and UG-LMAE.

Expected results and/or Products

The final result of the INRAM project will primarily be a novel approach to integrated monitoring and assessment of the health and the state of the marine/coastal ecosystem.

The envisaged approaches have the potential to become standard techniques for marine monitoring and assessment. The project will also produce concentration data of priority contaminants that will be made available at the national and international level.

The results will be transferable to other disciplines involved in the study of the marine environment such as ecotoxicology, marine modelling etc ...

Partners

Activities

Laboratory of Environmental Toxicology and Aquatic Ecology (UG-LMAE)

Research themes of this group focus on fundamental and applied aspects of aquatic toxicology and ecological risk assessment. They have an extensive experience in the study of the effects and bioavailability of endocrine disruptors, persistent organic pollutants and metals.

Management unit of the North Sea Mathematical Models (MUMM)

MUMM uses mathematical modelling to improve understanding of marine phenomena. It executes and coordinates extensive chemical measurement campaigns and aims to develop strong links between model results and observations.

Laboratory of Chemical Analysis (UG-LCA)

This laboratory has an internationally recognised expertise, experience and technology for the identification and quantification of pharmaceuticals and environmental contaminants in relevant matrices.

Department Biology, Marine Biology Section (UG-LMB)

This section is specialised in biological and ecological research in marine/estuarine ecosystems with focus on monitoring of macrofauna and meiofauna and on population dynamics and biodiversity in the North Sea.

Flanders Marine Institute (VLIZ)

Functions as data and information centre with rapid and open access to high quality data and information from a wide range of marine sciences.

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