

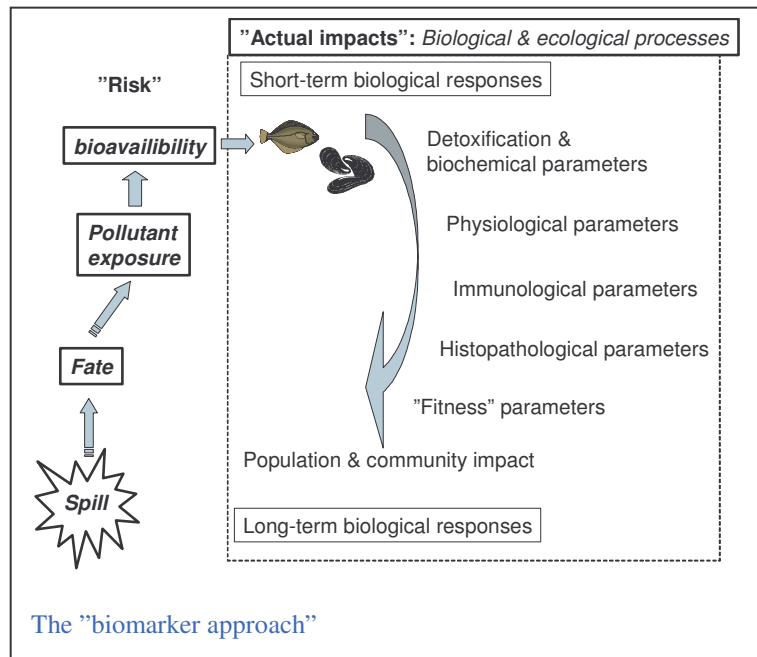
# PRAGMA - A pragmatic and integrated approach for the evaluation of environmental impact of oil and chemicals spilled at sea: input to European guidelines

## 1. Project description

In the frame of the “Call for proposals 2005 in the field of Community Cooperation against accidental or deliberate marine pollution”, the European Commission DG Environment has retained the PRAGMA project which addresses priority field n°4 “*Environmental impact of oil spills and other harmful substances*” of the community framework. PRAGMA will address several issues related to that theme but more specifically related to the long term impact.

Beyond the immediate catastrophic effect of spill causing death of thousands of marine organisms, a major environmental risk to consider is the long term impact of oil and chemical spills on the local ecosystem. Biodiversity study of benthic organisms or/and the comparison between contaminant levels measured in water, sediment and biota to threshold levels established by international (e.g. the ecotoxicological assessment criteria – EAC - defined by OSPAR in 1997) or national agencies have traditionally been used as the main decision criteria. Biodiversity is ecologically very relevant but this requires years of observation because significant changes in population might only be visible on a long temporal scale. Also, it is not easily applicable for organisms living in

the water column. The chemical data include sensitive and accurate measurements that provide both qualitative and quantitative figures of

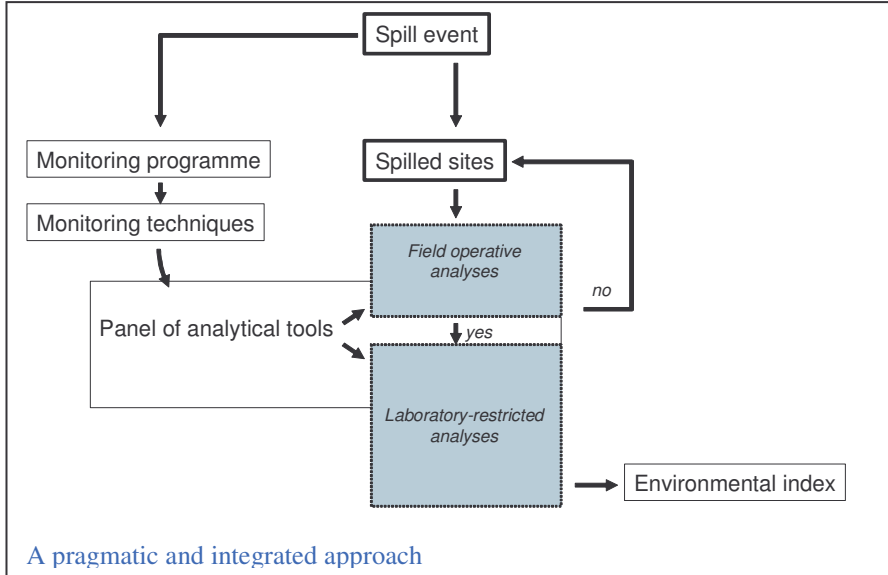


the presence of toxic substances and hence assess the hazard of exposure to the marine biota. Yet, the threshold levels which are defined according to the EU-Technical Guidance Document (EC, 2003) allow defining the risk based on the PEC/PNEC ratio but are not an expression of the actual impacts. In recent years, new criteria based on the measurements of biological markers (“biomarkers”) capable of identifying subtle changes with possible important consequences for the organisms sampled in polluted zone have been proposed. Compared to chemical analysis, a biomarker response will indicate that the pollutant has induced a biological response. Eventually, that response may persist over long time



even though the presence of the pollutant is no longer detectable. The ultimate goal with biomarkers is to evaluate the general health of individuals following exposure. Parameters related

monitoring programmes. This approach ought to be harmonised at the EU level in order to implement these techniques in current assessment and monitoring guidelines. Based on this concept, the



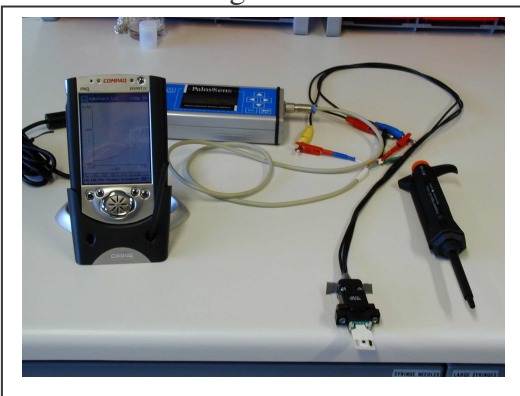
goal of PRAGMA will be to evaluate a battery of tools based on well-known biological methodologies and others new available tools based on biosensors for their possible incorporation in current EU guidelines related to spill

to growth and reproduction are particularly ecologically relevant since they can help to predict impairments beyond the individual level. Other analytical techniques related to developing cost-effective screening devices used at the desired temporal and spatial scale ought to be considered in the pragmatic assessment of environmental impact. Lately, arrays of sensors based on physical, chemical and biological signals have been proposed for the monitoring of the environment.

events and for the monitoring of the environmental effect of spills.

The following tasks will be aimed in the project:

- To evaluate existing methodologies based on biologically-important effect markers used in monitoring programmes and studies following some recent case studies with oil spill and chemical spill along the coastal zone of the Member States
- To propose the methodologies that can be used as a common platform in environmental monitoring of spills and contingency plans
- To incorporate simple, cost-efficient and manageable analytical tools in future pollution monitoring programme within the member states.
- To promote exchange of scientific and technical expertise in the field of environmental pollution monitoring
- To run pilot studies with key representative species (fish and mussel)
- To disseminate the protocols, research results at international/European level.



A combination of sensors as front line monitoring tools and both chemical and biological markers could be incorporated in future marine



IRIS (Norway) is the leader of the project and three other partners are involved, *Le Cedre* (France), University of Brest (France) and University of Bilbao (Spain). In addition, work related to biosensors will be contracted with the University of Florence (Italy).

## 2. Organisation of the work

PRAGMA is a pilot project and will be organized through four main work activities:

### **A. Evaluation and selection of analytical methods**

Simple and easy-to-perform methodologies that can indicate general health status and impairments connected to reduced fitness of individuals will be prioritized. Other more in deep techniques will also be used. Biosensors will be evaluated for their cost-effective use in biomonitoring.

### **B. Pilot study experiments**

Taking case studies in recent accidents (*Prestige, Erika, Ievoli Sun ...*) exposures with heavy oil and styrene will be simulated in the laboratory. The selected set of biomarkers will be tested using both fish and bivalves including sensitive stages in conjunction with analyses of chemical measurements. Test simple protocols, based on rapid low-cost analytical tools for routine application of biological and chemical monitoring applicable on field.

### **C. Analysis of results**

The information coming from the pilot studies will be integrated into an environmental index used to environmental agencies and decision-makers in case of spill.

### **D. Dissemination of knowledge and input to EU guidelines**

The project will contribute to technical and scientific exchanges between nations. At the community level, common future procedures will be identified enabling good operational practises for pollution monitoring. This initiative may help to define European research priorities and for example enhance the implementation of the water directive framework within EU members.

## 3. Project start and plan

The EU DG Environment has issued a contract to IRIS starting from the 14<sup>th</sup> February 2006. The project will be eligible for a period of 14 months. The

work will be distributed between the different partners. IRIS will be responsible for the experimental work with bivalves (*Mytilus edulis*). Le Cedre will be responsible for the experimental work with fish. Both the University of Brest and University of Bilbao will participate with their respective competence and experience in the field of biomarkers. The University of Florence will do the analytical work related to biosensors

Experiments are planned to run for several months including an exposure period (4/5 months) and a recovery period (1 month).

An update of events will be regularly made in the course of the project

## 4. The partners in brief