

**EUROPEAN COMMISSION  
Directorate-General for  
ENVIRONMENT**

**Grant application forms  
2006**

***Community framework for  
cooperation in the field of  
accidental or deliberate marine  
pollution***

**APPLICATION FORMS**

**Sections A and T**

**NOTE:**

**Note that the financial forms are in a separate file.**

**SECTION A :**  
**Summary and**  
**Administrative**  
**information**

**EUROPEAN COMMISSION**

ENVIRONMENT DG

FOR COMMISSION USE ONLY

Proposal n°

**PROJECT**

Project title (max. 60 characters):

Response means to chemicals spilled at sea and environmental damage

Project short title (max. 25 characters): Response to chemical spills (RESPIL)

The project will be implemented in the following:

Country(ies) Norway, France (**partnership**) – France, United Kingdom (UK) (**subcontracting**)

Starting date: 01 February 2007; Ending date: 01 April 2008;

Duration in months: 14 months

**APPLICANT AND PARTNERS**

Name of applicant (beneficiary – B): IRIS – International Research Institute of Stavanger (Norway)

Name of partner (1): Cedre (France)

Name of partner (2): University of Bretagne Occidentale/IUEM/LEMAR (France)

**PROJECT BUDGET AND REQUESTED EC FUNDING**

Total project eligible cost: 299,005 €

EC financial contribution requested: 148,154 € (= 49.55 % of total project eligible cost)

**PROJECT POLICY AREA / THEME**

The project aims at (choose only one category):

- Global evaluation of environmental impact of accidents occurred during the past five years and progress in damage assessment
- Evaluation of the state of the art of the response to marine pollution accidents at European level
- Response to chemical pollution
- Recovery of heavy oil
- Marine pollution monitoring and detection by aerial surveillance and satellite images
- Role of NGOs and volunteers in the field of response to marine pollution
- Claim management

Other, i.e.: .....

**PROJECT SUMMARY**

Methodologies to assess environmental damage and recovery following chemical pollution are needed. The project will propose a panel of well-established biological- and ecotoxicological methodologies for their use in this assessment. The usefulness of the methodologies will be tested in laboratory controlled conditions and in field (mesocosm) conditions using a selection of representative chemicals and marine bivalves as sentinel organisms. The outcome of this project should have valuable implication in the monitoring of chemical pollution through cooperation among Member States, implementation of evaluation methods in EU guidelines and other international working group like IMO/GESAMP.

<b>APPLICANT DECLARATION</b>
------------------------------

The undersigned hereby declares on oath that the company/organisation mentioned acting as applicant in this proposal is not in any of the situations mentioned below:

- a) they are bankrupt or being wound up, is having their affairs administered by the courts, have entered into an arrangement with creditors, have suspended business activities, are the subject of proceedings concerning those matters, or are in any analogous situation arising from a similar procedure provided for in national legislation or regulations;
- b) they have been convicted of an offence concerning their professional conduct by a judgement which has the force of *res judicata*;
- c) they have been guilty of grave professional misconduct proven by any means which the Commission can justify;
- d) have not fulfilled obligations relating to the payment of social security contributions or the payment of taxes in accordance with the legal provisions of the country in which they are established or those of the country of the contracting authority or those of the country where the contract is to be performed;
- e) they have been the subject of a judgement which has the force of *res judicata* for fraud, corruption, involvement in a criminal organisation or any other illegal activity detrimental to the Communities' financial interests;
- f) following another procurement procedure or grant award procedure financed by the Community budget, they have been declared to be in serious breach of contract for failure to comply with their contractual obligations.

I the undersigned understand that grant agreements may not be awarded to candidates who during the award procedure are guilty of misrepresentation in supplying, or fail to supply, the information requested by the Commission.

I also declare that:

1. the actions listed in this proposal do/will not receive aid from the Structural Funds or other Community financial instruments. In the event that any such funding will be made available after the submission of the proposal or during the implementation of the project, the applicant will immediately inform the Commission, which will in turn take the most appropriate action;
2. should the proposal be accepted, then the applicant will conclude with the partners/co-financiers, any agreements necessary to the completion of the work, provided these do not infringe on their obligations, as stated in the decision of the Commission. Such agreements should describe clearly the tasks to be performed by each partner and define the financial arrangements;
3. where, in the case the project is financed, one or more partners cancels or reduces his/her financial participation, the applicant will guarantee the total financial cover for the project;
4. I have carefully read the Model Grant Agreement;
5. I am in the legal position to sign this statement on behalf of my/our company/institute.

I certify, to the best of my/our knowledge that the statements made in this application are true, and the information provided is correct.

<b>Person entitled to enter into legally binding commitments on behalf of the applicant organisation</b>	Name:  Status/title:
<b>Seal and signature</b>	
<b>Date</b>  <b>Place</b>	

## DETAILED DESCRIPTION OF THE PROJECT

### I. Objectives

#### I.a – *Background and rationale*

An increasing number of chemicals are transported each year by shipping in bulk and packages worldwide on a routine basis. In Europe, shipping routes are composed of corridors and seas where a significant risk for accidental discharges exists like in the English Channel, at the entrance of the Strait of Gibraltar or the Strait of Bosphorus and in the Mediterranean Sea. Both the English Channel and the North Sea represent 70% of the maritime traffic. The composition of the shipped substances varies. Mainly acids (chlorhydric, nitric etc.), alcohols (methanol and ethanol), vegetal and animal oils and organic compounds (naphthalene, phenol, styrene, xylene, benzene etc.) are regularly transported on the European seas. During the past 50 years, a total of 69 major accidents with chemical tankers, cargoes, container-carrying ship and ferries have been recorded (Ecopel, Cedre). In most cases, the chemical products are shipped in bulk in large containers. The conditioning in large containers is inevitably conducting to large volume released in the sea within a short period in case of collision, wreckage or explosion. Hence, tonnes of a chemical, sometimes more than one, with potentially catastrophic effects can be released in the marine environment at the spot of the accident. The *levoli Sun* wreckage in October 2000 is a recent example where 4000 tonnes of styrene together with 1000 tonnes of each methyl ethyl ketone and isopropyl alcohol were released 11 miles from the land. Toxicological data on the effects of these chemicals on aquatic organisms are few and, in many cases methodologically unreliable. Often, no data on long-term effects are available. This scarce knowledge can not be accepted for a chemical like styrene with a production range in Europe of about 2 to 5 million tonnes per year. Likewise, approximately 30 million tonnes of vegetable, animal and fish oils are transported annually in bulk by sea. The few aquatic toxicity studies available show that not all are “non-toxic” to the aquatic environment as it was claimed before. This may partly be due to the presence of “impurities” of low molecular weight (<http://gesamp.imo.org/no74/GESAMP-74-fulltext.pdf>).

To date, the monitoring methods to evaluate the status of the environment following a chemical spill are often based on the measurement of chemical concentration in the water, and for some selected chemicals on the basic knowledge of physico-chemical parameters related to behaviour and fate. In some instances, the experimental conditions in which these parameters are established do not reflect the actual field conditions. In most cases, the biological impacts at short- and longer term remain poorly described. Consequently, the current methods yield only estimates and further improvements describing the environmental effects and the recovery time after accidents are needed.

Critical question which the public, the fisheries and aquatic farms are entitled to ask to the environmental authorities, technical and scientific staff intervening on the site of the pollution is “Can we safely conclude that the environmental status is back to normal following the spill and can we resume our activities as they were before the spill?” To answer these questions, one has to consider several issues like i) the feasibility of an intervention to clean the spoiled area ii) the risk for the staff to treat the polluted site iii) the toxicity of the chemical and iv) last but not least, the short- and long-term effects on aquatic biota. In some instances, it is not possible to intervene because of organisational issues or also because the chemical may dissolve very rapidly in the water column hence being immediately diluted in the water column and “out of reach” for any intervention. In these cases, environmental authorities may have to base their assessment on available data and the current methodologies may not be sufficient to support their decision. This may lead to maintenance of the restrictions on fisheries and recreational areas for longer period than actually necessary, with important economical consequences, or on the contrary early re-opening of the spilled area underestimating the persistence of the contaminant on seafloor and shorelines. Hence, other methodologies should be proposed to complement the existing European guidelines, harmonised some methodologies within the EU countries and be better prepared to respond and assess the possible ecological hazard following chemical spills. This issue should be clearly raised at the level of several European countries and thereby cooperation among Member States ought to be stimulated to fill this gap.

#### I. b – *Regulation, chemical classification and behaviour*

The International Maritime Organization (IMO) has the responsibility to regulate the carriage of chemicals at sea. International treaties i.e. International Convention for the Safety of Life at Sea ([SOLAS](#)) and the International Convention for the Prevention of Marine Pollution from Ships, as

modified by the Protocol of 1978 relating thereto ([MARPOL 73/78](#)) have been established and are regularly updated as new chemicals and new advances are made. The regulations cover chemicals carried in bulk, on chemical tankers, and chemicals carried in packaged form ((Wells et al. 1999), see also <http://gesamp.imo.org>).

While MARPOL Annex III deals with the “Prevention of pollution by harmful substances in packaged form” identified through the IMDG Code (extreme pollution potential – “PP” & pollution potential “P” labelling), MARPOL Annex II grades “noxious liquid substances carried in bulk” (NLS) into four categories graded A to D (*major hazard to recognizable hazard*), according to the hazard they present to marine resources and human health. Re-evaluation of the hazards of the substances listed in the International Bulk Chemicals (IBC) Code is regularly requested by IMO. Since 1995, the hazard criteria reviewed by Evaluation of Hazardous Substances Working Group (GESAMP’s EHS) are very much harmonised with those used by OECD. In 2004, a revised MARPOL Annex II was launched. It includes a new four-category classification for NLS i.e. Category X (major hazard), Category Y (hazard), Category Z (minor hazard), other substances (NLS that are considered to present no harm to marine resources). This new classification should be enforced by the 1<sup>st</sup> of January 2007. Alongside the revision of Annex II, the marine pollution hazards of thousands of chemicals have been reviewed by the GESAMP’s EHS, giving a resultant GESAMP2 Hazard Profile which indexes the substance according to its bio-accumulation; bio-degradation; acute toxicity; chronic toxicity; long-term health effects; and effects on marine wildlife and on benthic habitats. In 2003, of the 680 IBC Code substances registered, some 90 did not contain sufficient data for IMO to assign pollution categories (<http://gesamp.imo.org/no74/GESAMP-74-fulltext.pdf>).

In order to evaluate the potential ecological hazards of chemical spills, a critical point is to define whether they can be bioavailable and hence taken up by marine organisms. This will very much depend on their short term behaviour (fate) once discharged to the sea. Following the Bonn Agreement (<http://www.bonnagreement.org/>), four main categories of chemical products can be identified: they include evaporators (substances which evaporate very fast), floaters (substances which remain at the surface of the water), dissolvers (substances that dissolve fast in the water column) and sinkers (substances that dissolve slowly in the water column and eventually fall onto the seafloor) (see also Koops, 2005). Several techniques are developed for detecting and monitoring spilled substances. However, the techniques available are quite dependent on the behaviour of the chemical after the discharge. For example, substances floating and eventually polymerising at the surface, pumping and eventually trawling using netting of an appropriate dimension can have efficient cleaning effects. These substances are also easy to detect from aerial observations. The use of dispersants may in some cases enhance the dispersion of the substance in the water column. However intervention with dispersants may also increase the bioavailability and the toxicity towards the aquatic life. The largest operational challenges are for the substances that dissolve in the water column or sink to the seafloor. No sufficient techniques are truly available. At the same time, dissolvers and sinkers are those that would likely have the highest ecological consequences for the aquatic environment after a spill as they can disperse readily and are not highly volatile. Floaters may also arise for hazard in case they reach shallow waters during for example the sensitive spawning season of a number of organisms including fish and invertebrates with developing larvae closely associated to the surface. The true evaporators are of fewer problems for the aquatic environment unless they dissolve in the seawater as well.

#### **I. c – Objectives of the proposal**

In this project, we will focus on the category of substances which can pose a large risk for the aquatic environment and for which few intervention and response techniques are available.

The questions we would like to address in this project are:

Are the existing physico-chemical and toxicity data available for chemicals shipped in bulk and packages sufficient to conclude on the hazard for the marine life?

Are the current methodologies sufficient to monitor and assess the environmental status post-spill?

Can we propose additional methodologies based on biological and ecotoxicological markers and what is their responsiveness towards chemicals?

Can we use these methods *in situ* for the biomonitoring of the environment following chemical spill events?

Can these methods help to assess the recovery of the spilled area and hence help decision-makers in EU countries in their assessment towards the public, the fisheries and the aquatic farms?

With this set of questions in mind, the project will aim at

- Selecting chemicals based on factors like the probability in the European Union Maritime waters according to the study of ship accidents as background information and the dangerousness of the chemical substances for the marine environment.
- Reviewing the existing data on the physico-chemical behaviour and toxicity of the selected substances in the marine environment
- Propose additional biological and ecotoxicological methodologies that can be used as common platform within Member States in the environmental monitoring of chemical spills.
- Run experimental pilot studies in the laboratory to
  - improve the knowledge of the physico-chemical behaviour in marine environment and fate
  - expose sentinel marine organisms to chemicals by simulating massive discharge in controlled conditions, use the suggested methodologies and follow up both the impact and the recovery time
  - test the feasibility to employ other cost-effective screening tools
- Validate the usefulness of the methods in conditions approaching those found in the field using a mesocosm setup (“floating cells”)
- Integrate the selected methodologies in preparation response, awareness and environmental guidelines at the European level

## II. Actions and means involved

### II.a - **Organisation of the project (Task ID A.1)**

The coordination of the whole project will be done by the Norwegian applicant institution IRIS. IRIS will have the main assignment for the:

- Management of the project and formal contacts with EU representatives
- Technical organisation of the project
- Synthesis of project outcomes and reporting to the EU
- Enhancement and dissemination of the results through the creation of an internet site under the one existing at IRIS ([www.irisresearch.no](http://www.irisresearch.no))

In addition, IRIS will have the technical responsibility of performing the pilot exposure in the existing facility of Akvamiljø as, the sister company of IRIS.

The project management will consist of i) the personnel & administrative managers of each applicant/partners whom will have the administrative responsibility of the project and contractual relationship with the commission, ii) a technical and scientific expert group consisting of the contact persons (as referred in forms A5) from the applicant and each partner institute/university. The contact persons will delegate and organize the work with the other staff inside their respective institute/university. They will also communicate and organize the work in connection with the subcontractors.

The staff of the technical and scientific management will meet at the onset of the project to organize practical issues and discuss the different research activities as described below. At the end of the project, a final meeting will be held before the final technical implementation report will be issued to the EU. Regular contact will also be held during the course of the project and the web page of IRIS will be used as a communication platform together with other means.

The subcontractors will participate in the implementation of the analytical work within task ID A.3 and A.4. Cefas (Centre for Environment, Fisheries & Aquaculture Science, Dr. Stephen Feist, UK) and University of La Rochelle (Dr. Helene Thomas, France) will be subcontracted respectively by IRIS and Cedre. Alternatively, UPV/EHU (Universidad del Pais Vasco, Spain, Dr. Miren Cajaraville) will be contacted to perform some of the analytical work.

The chart below (figure 1) summarises the organisation of the administrative and technical/scientific management, and their implication in the task implementation.

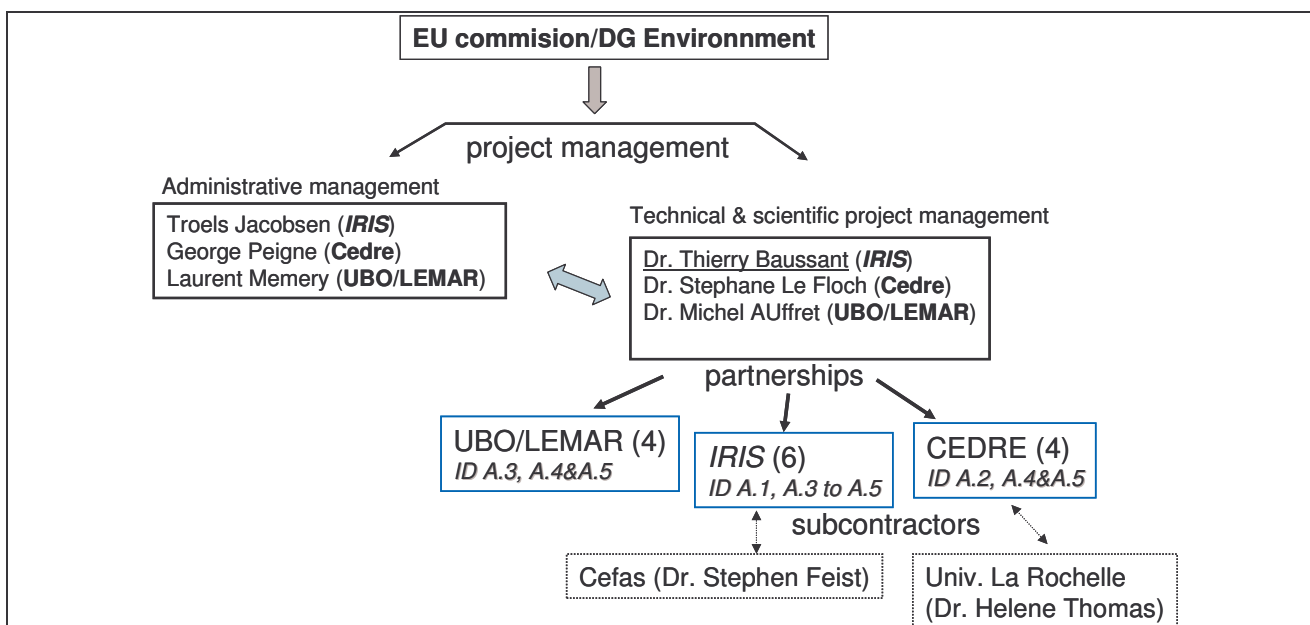


Figure 1 – Project management organisation. The number in parenthesis for each partner is the expected number of staff involved for the implementation of the different ID actions.

## II.b – Description of the actions (Task ID A.2 to A.5)

### Task ID A.2. Selection of chemicals and review of the corresponding existing data

In this action, a selection of chemicals will be made based on several existing information. In this process, we will benefit of past projects like the EU-funded HASREP (2004) and ECOPEL (Le Floch et al, 2005) which have clearly contributed to identify ways of classifying the risk posed by chemicals and tested the behaviour of some of them at sea. In HASREP, a tool for the evaluation as well as for the comparison of relative risks for different substances and several locations was proposed based on a set of criteria. The methodology allows identifying which chemical products present the highest risk according to factors like shipping frequency, quantity and dangerousness. The dangerousness is established after the MARPOL classification, which also take into consideration other factors like the physico-chemical behaviour.

Other published studies will be used to support the selection. For example, a recent study by McCay et al. (2006) on spill hazard evaluation for chemicals shipped in bulk using modelling has lead to the ranking of 25 chemicals presenting the highest hazard to aquatic biota.

In addition, the list of selected chemicals will be based on other relevant information. The European Coast Guard list like C.R.O.S.S. Gris Nez will be valuable. Reported recent incident in European waters like the *levoli Sun* will also help defining the chemical selection.

However, with regard of the economical frame and practical feasibility of the project within the 14 months period, we will limit the selection to a maximum of 3 substances.

### Task ID A.3. Experimental study in laboratory-controlled conditions

The selected chemicals from ID A.2 will be used in a set of experimental studies to expose marine organisms. In this project, we will choose key sentinel species of bivalves like mussels (*Mytilus sp.*) and oysters (*Crassostrea sp.*). The rationale for that is i) the use of these species in a large number of experimental studies, thereby contributing to a good knowledge of their basic physiology, ii) the relatively large concentration levels of substances usually found in these organisms due to their capacity to filter large volumes of water, thereby accumulating both particulate (dispersed) and soluble fractions, iii) the ease to maintain these species in the laboratory or also in cages experiment *in situ* which makes them appropriate for both short- and long-term experiments (see also Smolders et al. 2003).

The exposure system will consist of a set of tanks with continuous flow of the seawater and the contamination obtained through a mixing chemical-seawater header tank as illustrated in figure 2.

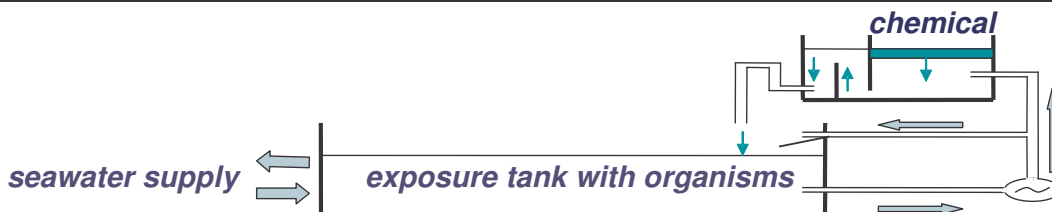


Figure 2 – Schematic representation of the experimental system in ID A.3 (adapted from Anne Bado-Nilles, 2005)

A period of acclimatizing, contamination (exposure) and decontamination (recovery) will be determined. The contamination period will last for a period of maximum 15 days followed by a recovery period of one to two weeks. Totally, each chemical will not be tested for a period longer than a month.

Sampling of organisms will be done once shortly after the exposure start, at the end of the exposure and at the end of the recovery.

Parameters which indicate a change in a biological response which can be related to exposure and toxic effects of chemicals will be measured. In this project, the emphasis will be put on biological markers and assays that can best be related to ecological impacts or “actual effects”. Also, as it is unrealistic to target specifically all existing or coming chemicals shipped at sea, the selection of parameters encompass and integrate a relatively large type of possible toxic effects (see table 1). The methods proposed here can indicate symptoms and pre-pathological alterations that can be detected before more serious disturbances as mortality and population change occur. The selection proposed is also based on other criteria like the cost-effectiveness, the ecological relevance and the possible deployment for *in situ* monitoring (see also Depledge and Galloway 2005; Galloway et al. 2004; Moore et al. 2004).

Type of methods	Short description and link to effects	Some references
Physiological	Condition indices i.e. ecophysiological measures of the health status of animals that summarizes the physiological (growth, reproduction) activity of organisms, hence used as general condition indicators; Clearance rate i.e. a non-destructive physiological biomarker of aquatic pollution related to feeding behaviour and often included in bioenergetic assessment in filter-feeders; Lysosome membrane stability i.e. general indicator of physiological health assayed by the “neutral red retention time” in lysosomes of hemocyte. A general physiological stress indicator that is recommended by OSPAR/JMP. The lysosomes play an important role as a natural immunological defence system in bivalves.	Pampanin et al. 2005a; Pampanin et al. 2005b; Smolders et al. 2002; Petersen 2004; Sejr et al. 2004; Toro et al. 2003 Lowe and Pipe 1994; Moore and Willows 1998
Histochemistry/ Histopathology	Histopathological alterations in selected tissues (gills, digestive gland and gonad mainly) that are conceived as tissue-level biomarkers. Histo-pathological parameters are considered highly ecologically relevant responses usually indicative of irreversible injuries of exposure to a variety of pollutants. Relevant parameters to consider are the proliferation of intracellular peroxisome and the change in intracellular accumulation of neutral lipids, lipofuscin or lysosomal structural changes.	Cajaraville et al. 2000; Orbea et al. 2006; Petrovic et al. 2004
Immunotoxicity/ Immuno competence	Any alteration of internal defences like stress-may induce immuno-suppression and potentially compromise bivalve population dynamics. Sensitive and easy-to-measure parameters are hemocyte counts and phagocytosis-related cellular events. The cost-effectiveness of these methods have	Galloway and Depledge 2001; Pampanin et al. 2002a; Pampanin et al. 2002b; Auffret, 2005, Bado-Nilles, 2005

	been considerably improved by the use of fluorescein-labeled latex beads in cell suspensions analysed by flow cytometry	
Genetic	Genotoxic markers that evaluate impairments in the genetic material (DNA) of cells. The Comet assay measures alkali-labile strand breaks as a measurement of DNA integrity. This test has been tested successfully on several marine organisms including bivalve molluscs and could be recommended for routine analysis in environmental monitoring.	Lee and Steinert 2003; Lemos et al. 2005; Mamaca et al. 2005; Mitchelmore and Chipman 1998; Taban et al. 2004
Endocrine	Endocrine disruptors are substances that disturb the hormonal balance regulating a large number of proteins with important functions in organisms. In bivalve, the level of vitellogenin-like (Vg-like) proteins in the hemolymph can be indirectly determined using a simple and rapid alkali-labile phosphate (ALP) measurement assay. This assay is used as a biomarker of estrogen disruption in shellfish.	Blaise et al. 1999; Ortiz-Zarragoitia and Cajaraville 2006; Pampanin et al. 2005a; Aarab et al. 2004
Bioassay	Embryos and larvae of most species are the critical phases and the sensitivity to chemicals is usually higher than of their parents. Thereby bioassays can allow for a qualitative assessment of the environment for example post-spill to evaluate the residual toxicity of the water after cleaning operation or natural degradation processes. Here a simple and relatively cost-effective assay will be used on mussel larvae to evaluate the development anomalies in the experimental conditions.	ASTM 1989; His et al. 2000; Quiniou F. 2005

Table 1 – List of methodologies to assess environmental damage in marine organisms

**Task ID A.4. *In situ* validation using a pilot mesocosm study**

In this action, the goal is to validate in more realistic *in situ* conditions the use of the proposed methodologies for response to chemical pollution and assessment of environmental damage. In addition, we would like to test other *in situ* intervention techniques that can be used to monitor the level of chemicals in the water like the use of a portable UV spectrofluorimeter (for those compounds absorbing UV), and possibly other rapid/cost-effective screening device like single biosensor - or multi-array electronic tongue for the determination of the potential toxicity of the water. Ongoing project activities at IRIS related to biosensor techniques and their use in environmental assessment will contribute to establish a synergy with valuable output for this action.

The tests will be carried out in floating cells consisting of 4m<sup>3</sup> units, closed at the bottom and open at the surface as illustrated in figure 3. The cells will be deployed in the Bay of Brittany (France). This set-up allows close-to-natural movement of the sea surface after swell, wind and influence of rain or sun. Environmental data will be followed up and recorded during the course of the study.

At the onset of the exposure, the bivalves will be placed at a depth of about 1 m under the surface. Thereafter, chemicals will be poured at the surface of the water inside the cells. Sampling time for seawater and biological analyses will be performed after the procedures decided during ID A.3.

After sampling of the organisms, we will analyse the same parameters as listed in table 1 under ID A.3.

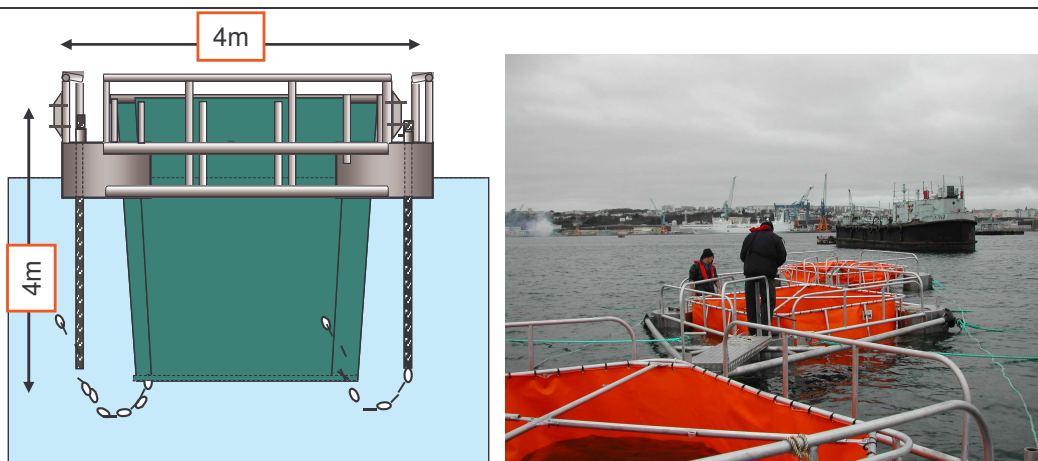


Figure 3 – Schematic illustration and picture of the floating mesocosm cells (photo: CEDRE)

### Task ID A.5. Dissemination of data and input to EU guidelines for chemical responses following spill

After the experimental and analytical parts of the project will be performed, the data should be made available for all the partners and the EU representatives. The public will have the possibility to follow the work progression. This could be made in the form of short newsletter published under the web site of IRIS ([www.irisresearch.no](http://www.irisresearch.no)).

The technical and scientific results of the pilot studies will be discussed among the partners. Several analytical methods to treat the data can be foreseen based on multivariate, chemometric or weight of evidence approach (Broeg et al. 2005; Handy et al. 2003; Auffret 2005). The entire set of the measured parameters will be used and normalization using values obtained in the reference groups should be considered. It is the goal to develop and propose methodology and criteria that can actually be used by operators, technical agencies environmental authorities and in EU regulatory framework for chemical response following spills. Therefore, we would like to communicate the results in an easy-to-use way that could consist of a ranking or a simple index used to assess the environmental quality of the spilled site during and after the accident and in order to take appropriate action. Several methodologies could be envisaged. Here, we should greatly benefit of the output of the ongoing PRAGMA project (EU agreement n° 07.030900/2005/429172/SUB/A5, [www.irisresearch.no/pragma](http://www.irisresearch.no/pragma)) since one ultimate goal of that project is to define an environmental index valuable for long-term biomonitoring studies of environmental pollution with oil and chemical spill. Other considerations based on the 2007 classification by IMO/GESAMP2 or the proposed risk rating methodology developed in the EU-HASRAP (2004) should be included.

Beyond the dissemination of the project goals and progress onto the website of IRIS, different levels of dissemination will be considered. The technical and scientific results will be published in peer-reviewed articles in international journals. A final technical report will also be issued to the DG Environment according to the grant agreement between the applicant and the commission. Participation to workshop and seminar will also be supported as long as budget frame allows it.

#### Expected results

#### Methodology to assess environmental damage in case of marine pollution by chemical products

- To date, the methods used to evaluate the environmental effects of an acute release of a chemical have often been based on measurements of chemical and other physical variables considered being important, such as the concentration of the chemical, its solubility and fate in the water. Only few agreed methodologies among the Member States are available for assessing effects to the environment. The methodologies proposed in this application indicate biological changes at different levels of organisation and of different vital functions for the organisms. Hence, they can be considered as diagnostic methods for responses to environmental changes like after chemical spill. Considering the diversity of chemical substances currently transported by ship and the future new bulk liquid chemical substances entering the IBC Code, a set of relatively broad effect parameters is chosen. This multiparametric approach should increase the environmental

relevance and, together with seawater and body chemical measures, should help for a better assessment of chemical contamination in coastal waters following spill events and recovery post-spill.

- Moreover, few ongoing methodologies can provide a quick assessment of the environmental status and the cost of the analytical work may restrict the number of samples. Hence only few sites that can be monitored. The consequences of that are that the current monitoring practices may give only a snapshot of the situation. Moreover, the information obtained can only express a potential hazard but not the *actual* effects. A more representative panel of methods for biomonitoring and environmental assessment ought to be included. A number of the proposed biological-and ecotoxicological-based methodologies are already under evaluation or even included in other international commissions in water quality assessment like ICES, UNEP and OSPAR. Some of them can be applied for *in situ* monitoring and can give relatively fast results in a relatively cost-effective way. With additional portable instrumentation, optimisation of protocols and further investigations, the proposed methods can be envisaged to be readily and routinely applied for in field monitoring.

- Although methodologies related to biosensors will not be fully implemented in this project, we will make some trial by bridging other ongoing activities at IRIS. The large throughput of these devices can be valuable in the response techniques to deploy after a chemical pollution.

### **Contribution for the revision in future hazard evaluation procedure within GESAMP**

Clearly, one outcome of this project will be to provide valuable information on guidance and preparedness for assessing environmental damage. By this mean, the project should contribute to significant inputs for the definition of chemical hazard profile and the categorization of current and coming bulk liquid substances, which is done under the responsibility of IMO.

Since the first 1973 GESAMP chemical hazard evaluation based on the intrinsic properties of the chemicals, environmental science has evolved considerably and diagnostic methods, often used in medicine or pharmacology for human health, are also possible to apply for the aquatic environment. GESAMP has also revised the hazard evaluation by updating regularly their procedures, using timely concepts in environmental toxicology, and a larger number of environmental end-point parameters including acute and chronic aquatic toxicity are presently considered. Yet, for some substances, little data may be available. A continued evaluation of substances entering the IBC Code and IMDG Code will be assigned to IMO/GESAMP working group and an expanded set of hazard and effect endpoints which are well established, like those proposed therein, will be required. Hence, the results of the project could assist IMO's work of defining safety thresholds and providing a set of parameters broad enough to cover the environmental effects of several chemical classes.

### **European dimension**

The project will involve several countries already very much implicated in developing methodologies and assessing their application in the marine environmental, more specifically towards pollution. A number of accidents have impaired drastically the European coast line in the past and lessons should be learnt from previous accidents. To some extent, this project will contribute to compare methods, improve and stimulate cooperation between these European States, in order to be better prepared to respond to pollution, assess the environmental damage and communicate with the public and industries which are questioning the quality of the environment post-spill.

## Litterature cited

- Auffret M. 2005. Chapter 3: Bivalves as models for marine immunotoxicology. In Investigative immunotoxicology. H. Tryphonas, M. Fournier, B.R. Blakley, J.E.G Smits and P. Brousseau (eds). CRC Press, Boca Raton, pp. 29-48
- ASTM. 1989. Standard guide for conducting static acute toxicity tests with larvae of four species of saltwater bivalve molluscs. American society for testing and materials (ASTM). Philadelphia: ASTM. p 334-351.
- Bado-Nilles A. 2005 – Environnement et immunomodulation: etude de l'effet de la fraction soluble d'un fuel lourd de type norvegien sur le systeme immunitaire de l'huitre creuse (*Crassostrea gigas*) et du bar commun (*Dicentrarchus labrax*). Master II degree report, University of La Rochelle, La Rochelle (France), 49pp.
- Blaise C, Gagne F, Pellerin J, Hansen PD. 1999. Determination of vitellogenin-like properties in *Mya arenaria* hemolymph (Saguenay Fjord, Canada): A potential biomarker for endocrine disruption. *Environmental Toxicology* 14(5):455-465.
- Broeg K, von Westernhagen H, Zander S, Korting W, Koehler A. 2005. The "bioeffect assessment index" (BAI) - A concept for the quantification of effects of marine pollution by an integrated biomarker approach. *Marine Pollution Bulletin* 50(5):495-503.
- Cajaraville MP, Bebianno MJ, Blasco J, Porte C, Sarasquete C, Viarengo A. 2000. The use of biomarkers to assess the impact of pollution in coastal environments of the Iberian Peninsula: a practical approach. *Science of the Total Environment* 247(2-3):295-311.
- Depledge MH, Galloway TS. 2005. Healthy animals, healthy ecosystems. *Frontiers in Ecology and the Environment* 3(5):251-258.
- Galloway TS, Brown RJ, Browne MA, Dissanayake A, Lowe D, Jones MB, Depledge MH. 2004. A multibiomarker approach to environmental assessment. *Environmental Science & Technology* 38(6):1723-1731.
- Galloway TS, Depledge MH. 2001. Immunotoxicity in invertebrates: Measurement and ecotoxicological relevance. *Ecotoxicology* 10(1):5-23.
- Handy RD, Galloway TS, Depledge MH. 2003. A proposal for the use of biomarkers for the assessment of chronic pollution and in regulatory toxicology. *Ecotoxicology* 12(1-4):331-343.
- HASREP: Response to harmful substances spilled at sea. 2004. [http://ec.europa.eu/environment/civil/marin/mp05\\_en\\_projects.htm#2004](http://ec.europa.eu/environment/civil/marin/mp05_en_projects.htm#2004)
- His E, Beiras R, Seaman MNL. 2000. The assessment of marine pollution - Bioassays with bivalve embryos and larvae. *Advances in Marine Biology*, Vol 37. p 1-178.
- Lee RF, Steinert S. 2003. Use of the single cell gel electrophoresis/comet assay for detecting DNA damage in aquatic (marine and freshwater) animals. *Mutation Research-Reviews in Mutation Research* 544(1):43-64.
- Le Floch S, Even A, Mamaca E. 2005. ECOPEL: Etude du comportement des produits chimiques deverses en mer: experimentations en laboratoire et a l'echelle pilote. Final report, RITMER programme number 01G0764, Ministere de la Recherche, Paris (France), 106pp
- Lemos NG, Dias AL, Silva-Souza AT, Mantovani MS. 2005. Evaluation of environmental waters using the comet assay in *Tilapia rendalli*. *Environmental Toxicology and Pharmacology* 19(2):197-201.
- Lowe DM, Pipe RK. 1994. Contaminant Induced Lysosomal Membrane Damage in Marine Mussel Digestive Cells - an in-Vitro Study. *Aquatic Toxicology* 30(4):357-365.
- Mamaca E, Bechmann RK, Torgrimsen S, Aas E, Bjornstad A, Baussant T, Le Floch S. 2005. The neutral red lysosomal retention assay and Comet assay on haemolymph cells from mussels (*Mytilus edulis*) and fish (*Symphodus melops*) exposed to styrene. *Aquatic Toxicology* 75(3):191-201.
- McCay DPF, Whittier N, Ward M, Santos C. 2006. Spill hazard evaluation for chemicals shipped in bulk using modeling. *Environmental Modelling & Software* 21(2):156-169.
- Mitchellmore CL, Chipman JK. 1998. DNA strand breakage in aquatic organisms and the potential value of the comet assay in environmental monitoring. *Mutation Research-Fundamental and Molecular Mechanisms of Mutagenesis* 399(2):135-147.
- Moore MN, Depledge MH, Readman JW, Leonard DRP. 2004. An integrated biomarker-based strategy for ecotoxicological evaluation of risk in environmental management. *Mutation Research-Fundamental and Molecular Mechanisms of Mutagenesis* 552(1-2):247-268.
- Moore MN, Willows RI. 1998. A model for cellular uptake and intracellular behaviour of particulate-bound micropollutants. *Marine Environmental Research* 46(1-5):509-514.
- Orbea A, Garmendia L, Marigomez I, Cajaraville MP. 2006. Effects of the 'Prestige' oil spill on cellular biomarkers in intertidal mussels: results of the first year of studies. *Marine Ecology-Progress Series* 306:177-189.
- Ortiz-Zarragoitia M, Cajaraville MP. 2006. Biomarkers of exposure and reproduction-related effects in mussels exposed to endocrine disruptors. *Archives of Environmental Contamination and Toxicology* 50(3):361-369.
- Pampanin DM, Ballarin L, Carotenuto L, Marin MG. 2002a. Air exposure and functionality of *Chamelea gallina* haemocytes: effects on haematocrit, adhesion, phagocytosis and enzyme contents (vol 131,

- pg 605, 2002). *Comparative Biochemistry and Physiology a-Molecular and Integrative Physiology* 133(1):199-199.
- Pampanin DM, Marangon I, Volpato E, Campesan G, Nasci C. 2005a. Stress biomarkers and alkali-labile phosphate level in mussels (*Mytilus galloprovincialis*) collected in the urban area of Venice (Venice Lagoon, Italy). *Environmental Pollution* 136(1):103-107.
- Pampanin DM, Marin MG, Ballarin L. 2002b. Morphological and cytoenzymatic characterization of haemocytes of the venus clam *Chamelea gallina*. *Diseases of Aquatic Organisms* 49(3):227-234.
- Pampanin DM, Volpato E, Marangon I, Nasci C. 2005b. Physiological measurements from native and transplanted mussel (*Mytilus galloprovincialis*) in the canals of Venice. Survival in air and condition index. *Comparative Biochemistry and Physiology a-Molecular & Integrative Physiology* 140(1):41-52.
- Petersen JK. 2004. Methods for measurement of bivalve clearance rate - hope for common understanding. *Marine Ecology-Progress Series* 276:309-310.
- Petrovic S, Semencic L, Ozretic B, Ozretic M. 2004. Seasonal variations of physiological and cellular biomarkers and their use in the biomonitoring of north Adriatic coastal waters (Croatia). *Marine Pollution Bulletin* 49(9-10):713-720.
- Quiniou F. HE, Delesmont R., Caisey X. 2005. Bio-indicateur de la toxicite potentielle de milieux aqueux: bio-essai "developpement embryo-larvaire de bivalve. Ifremer, editor. 24 p.
- Sejr MK, Petersen JK, Jensen KT, Rysgaard S. 2004. Effects of food concentration on clearance rate and energy budget of the Arctic bivalve *Hiatella arctica* (L) at subzero temperature. *Journal of Experimental Marine Biology and Ecology* 311(1):171-183.
- Smolders R, Bervoets L, Blust R. 2002. Transplanted zebra mussels (*Dreissena polymorpha*) as active biomonitors in an effluent-dominated river. *Environmental Toxicology and Chemistry* 21(9):1889-1896.
- Smolders R, Bervoets L, Wepener V, Blust R. 2003. A conceptual framework for using mussels as biomonitors in whole effluent toxicity. *Human and Ecological Risk Assessment* 9(3):741-760.
- Taban IC, Bechmann RK, Torgrimsen S, Baussant T, Sanni S. 2004. Detection of DNA damage in mussels and sea urchins exposed to crude oil using comet assay. *Marine Environmental Research* 58(2-5):701-705.
- Toro B, Navarro JM, Palma-Fleming H. 2003. Use of clearance rate in *Choromytilus chorus* (Bivalvia : Mytilidae) as a non-destructive biomarker of aquatic pollution. *Revista Chilena De Historia Natural* 76(2):267-274.
- Wells PG, Hofer T, Nauke M. 1999. Evaluating the hazards of harmful substances carried by ships: The role of GESAMP and its EHS working group. *Science of the Total Environment* 238:329-350.
- Aarab N, Minier C, Lemaire S, Unruh E, Hansen PD, Larsen BK, Andersen OK, Narbonne JF. 2004. Biochemical and histological responses in mussel (*Mytilus edulis*) exposed to North Sea oil and to a mixture of North Sea oil and alkylphenols. *Marine Environmental Research* 58(2-5):437-441.

Applicant Profile Information					
Short Name	IRIS			Participant ref.	B
<b>Legal information on the applicant</b>					
Legal Name	International Research Institute of Stavanger AS			Legal Status	
VAT No	988944459-VAT			Public Private International organisation	
Legal Registration No	NO 988944459				X
Registration Date	17.10.2005				
<b>Legal address of the applicant</b>					
Street Name and No	Professor Olav Hanssens Vei 15			PO Box	8046
Post Code	4068	Town/City	Stavanger		
Country Code	NO	Country Name	Norway		
<b>Applicant contact person information (only if different to above)</b>					
Title	PhD	Function	Senior Researcher		
Surname	BAUSSANT		First Name	Thierry	
Department / Service Name	IRIS-Marine Environment				
Street Name and No	Mekjarvik 12			PO Box	
Post Code	4070	Town/City	Randaberg		
Country	Norway				
Telephone No	47 – 51875503		Fax No	47 - 51875540	
E-mail	<a href="mailto:thierry.baussant@irisresearch.no">thierry.baussant@irisresearch.no</a>		Website	www.irisresearch.no	
<b>Address of the main department of the applicant carrying out the project (only if different to above)</b>					
Street Name and No				PO Box	
Post Code		Town/City			
Country					
Department /Service Name					
<b>Other details</b>					
Year	2005				
Annual turnover	NOK 199.915.356 <sup>(1)</sup>		Annual Balance Sheet Total	NOK 137.759.357 <sup>(1)</sup>	
Number of employees	205 <sup>(1)</sup>				
Number of employees in department conducting project	29 <sup>(1)</sup>				
Is Your Organisation independent (Yes or No)	No				
If No, please indicate legal name(s) of owner(s) who own 25 % or more	University of Stavanger, 50 % Rogaland Research Institute, 50 %				
Is Your Organisation affiliated to any other participant(s) in the project? (Yes or No)	No				
If Yes, please indicate Partners Short Name(s) and character of affiliations(s)					
<b>Eventual consultant to applicant</b>					
Consultant Legal Name					

(1) IRIS was established by Rogaland Research Institute and University of Stavanger 17 October 2005. As of 1 January 2006, all research activity and personnel in Rogaland Research Institute were transferred to IRIS (transfer of business), see enclosed letter. Annual turnover, annual balance sheet total etc. for 2005 applies Rogaland Research Institute. The accounting period for IRIS will be 17.10.2005 – 31.12.2006.

Partner Profile Information					
Short Name	CEDRE		Participant ref.	1	
<b>Legal information on the partner</b>					
Legal Name	Centre de Documentation, de Recherche et d'Experimentations sur les pollutions accidentelles des eaux		Legal Status		
VAT No	FR58.315.429.142		Public	<input type="checkbox"/>	
Legal Registration No	315 429 142 00039			Private	<input checked="" type="checkbox"/>
Registration Date	25/01/79			Natural person	<input type="checkbox"/>
				International organisation	<input type="checkbox"/>
<b>Legal address of the partner</b>					
Street Name and No	715 Rue Alain Colas, CS 41836 - (FR)		PO Box	Cedex 2	
Post Code	29218 Cedex 2	Town/City	Brest		
Country Code	FR	Country Name	France		
<b>Partner contact person information (only if different to above)</b>					
Title	PhD	Function	Senior engineer		
Surname	LE FLOCH		First Name	Stephane	
Department / Service Name					
Street Name and No			PO Box	Cedex 2	
Post Code		Town/City			
Country					
Telephone No	+33 (0)2 98 33 10 10	Fax No	+33 (0)2 98 44 91 38		
E-mail	<a href="mailto:stephane.le.floch@cedre.fr">stephane.le.floch@cedre.fr</a>	Website	<a href="http://www.cedre.fr">http://www.cedre.fr</a>		
<b>Address of the main department of the partner carrying out the project (only if different to above)</b>					
Street Name and No			PO Box		
Post Code		Town/City			
Country					
Department /Service Name					
<b>Partner details</b>					
Year	2005				
Annual turnover	4,320,782 €	Annual Balance Sheet Total	6,955,637 €		
Number of employees	53				
Number of employees in department conducting project	12				
Is Your Organisation independent (Yes or No)	Yes				
If No, please indicate legal name(s) of owner(s) who own 25 % or more					
Is Your Organisation affiliated to any other participant(s) in the project? (Yes or No)				No	
If Yes, please indicate Participant Short Name(s) and character of affiliations(s)					

Partner Profile Information				
Short Name	UBO/LEMAR		Participant ref.	2
<b>Legal information on the partner</b>				
Legal Name	Université de Bretagne Occidentale		Legal Status	
VAT No	FR.68.192.903.466		Public <input checked="" type="checkbox"/> Private <input type="checkbox"/> International organisation <input type="checkbox"/>	X <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Legal Registration No	1929034660014			
Registration Date	01/01/1971			
<b>Legal address of the partner</b>				
Street Name and No	3, rue des Archives		PO Box	CS 93837
Post Code	29238	Town/City	Brest CEDEX 3	
Country Code	FR	Country Name	France	
<b>Partner contact person information (only if different to above)</b>				
Title	Dr	Function	Senior researcher	
Surname	AUFFRET		First Name	Michel
Department / Service Name	Institut Universitaire Européen de la Mer - Laboratoire des sciences de l'environnement marin (LEMAR)			
Street Name and No	Place Nicolas Copernic - Technopôle Brest-Iroise		PO Box	
Post Code	29280	Town/City	Plouzane	
Country	France			
Telephone No	(33) 2 98 49 86 49	Fax No	(33) 2 98 49 86 45	
E-mail	michel.auffret@univ-brest.fr	Website	www.univ-brest.fr/iuem	
<b>Address of the main department of the partner carrying out the project (only if different to above)</b>				
Street Name and No			PO Box	
Post Code		Town/City		
Country				
Department /Service Name				
<b>Partner details</b>				
Year	2005			
Annual turnover	N.A.	Annual Balance Sheet Total	N.A.	
Number of employees	1561			
Number of employees in department conducting project	40			
Is Your Organisation independent (Yes or No)	Yes			
If No, please indicate legal name(s) of owner(s) who own 25 % or more				
Is Your Organisation affiliated to any other participant(s) in the project? (Yes or No)				No
If Yes, please indicate Participant Short Name(s) and character of affiliations(s)				

Legal information on the co-financier				
Legal Name			Legal Status	
VAT No			Private	<input type="checkbox"/>
Legal Registration No			Public	<input type="checkbox"/>
			Legal person	<input type="checkbox"/>
			International organisation	<input type="checkbox"/>
Legal address of the co-financier				
PO Box				
Street Name and No				
Post Code				
Town/City				
Country Code		Country Name		
Co-financier contact person (only if different to above)				
Title		Function		
Surname			First Name	
Department / Service Name				
Street Name and No				PO Box
Post Code		Town/City		
Country				
Telephone No			Fax No	
E-mail			Website	
Funding details				
	Partners ref.	Partners Short name		
Project partner (s) which are financed by the co-financier				
Funding confirmed (Yes or To be confirmed)				
Comments				

**BRIEF DESCRIPTIONS OF THE STRUCTURE AND ACTIVITIES OF  
THE APPLICANT AND PARTNERS**

**Applicant ( beneficiary – B): IRIS**

In October 2005, RF-Rogaland Research and the University of Stavanger (UiS) have formed a new research company called **International Research Institute of Stavanger AS (IRIS)**. The new company is owned in equal shares by RF and University of Stavanger. The “Marine environmental” group of IRIS includes two affiliated companies: Akvamiljø and Akvamiljø Caspian. This group is now called IRIS&Akvamiljø and is a research centre with 30 scientists in environmental sciences related to the aquatic environment. Akvamiljø a/s owns an advanced laboratory with special facilities for long term exposures of chemicals and petroleum related compounds to marine organisms. The group has complementary expertise in marine chemistry, biochemistry, biology, ecotoxicology and microbiology. A broad scientific network throughout Europe and North America exists. The main areas of activities for IRIS&Akvamiljø are: controlled exposures of biota to pollutants, environmental health status - new methods, environmental risk assessment, field monitoring. Carrying out short- to long-term exposures to poorly water-miscible substances with several marine organisms, biomarker development and environmental application are strong fields of research in the center.

IRIS&Akvamiljø is performing research for oil companies, land-based industry, aquaculture industry and governmental institutions. Projects are also financed by Norwegian Research Council, EU, and NORAD.

In Norway, NOFO (<http://www.nofo.no>) is the oil spill response organisation established by the operating companies on the Norwegian continental shelf. NOFO ensures that authorities’ oil spill recovery guidelines are followed. Since 2001, the applicant is officially involved in NOFO as to follow up environmental status following spill events along the coastline.

IRIS complies with quality system standard NS-EN ISO 9001:2000 which is valid for the following activities: research and development, including laboratory and analytical services, advanced testing, development of software, technological advisory and scientific research. This certificate, initially attributed in 1995, is valid until October 22, 2007. In addition the institute has an extensive quality insurance system. At the onset of each project, a QA is nominated to approve the project tasks, to follow up the progress of the activities according to the plan, to approve any decisions taken concerning the management of the project.

Dr. Th. Baussant will be the scientist responsible for the performance of the project tasks of IRIS.

**Partner 1 - CEDRE**

**CEDRE** is a non-profit making association that reports to the Ministry of the Ecology and Sustainable Development and has a Board of Directors from Government represented by the Secretariat General of the Sea and the Ministries responsible for the Ecology, Defence, Transports and Infrastructure, Interior, Research, Industry and Fisheries.

The purpose of *Cedre* is to advise and assist the authorities in charge of accidental pollution response. Its role in the field of water pollution is specified in the Polmar circular of December 17<sup>th</sup> 1997 and the interministerial circular directive on accidental inland pollution of February 18<sup>th</sup> 1985.

This includes a 24-hour operational availability to authorities in charge of pollution response (phone: +33 2 98 33.10.10.).

*Cedre* provides assistance to the authorities as regards:

- design and update of response plans (e.g.: sea and land Polmar contingency plans);
- information on pollution response policies and techniques;
- improvement and evaluation of pollution response means and techniques;
- approval of pollution treatment agents;
- preparation of emergency guides (e.g. for assisting an oil tanker in distress, for response in case of a chemical spill);
- training of managers and response teams from administrations, cities and local authorities and the industry;

- organization of pollution response drills.

During accident involving pollution, *Cedre* assists the authorities as regards:

- assessing risks related to pollution;
- the choice of the best techniques and equipment to deal with the pollution and the organization of operations;
- assessing the consequences of both the pollution and the response.

*Cedre* also serves as an adviser to the European Commission's Directorate of the Environment for pollution response to oil and other chemical spills. *Cedre* has a pluridisciplinary team of 55 people (engineers, scientists, technicians) some of whom are on secondment.

Dr. Stephane Le Floch will be the scientist responsible for the project tasks of CEDRE

#### Partner 2: **UBO/LEMAR**

Laboratoire des Sciences de l'Environnement Marin (**LEMAR**) UMR 6539

Institut Universitaire Européen de la Mer ; Université de Bretagne Occidentale (**UBO**)

LEMAR (UMR 6539 « Laboratoire des Sciences de l'Environnement Marin » of CNRS) is a multidisciplinary laboratory of the Université de Bretagne Occidentale (UBO) harboured at the Institut Universitaire Européen de la Mer. Its general objective is to study and modelize biosphere - marine environment relationships, with complementary competencies in ecology, biology, microbiology, physics and biogeochemistry. The staff includes 25 researchers and 15 technical collaborators.

The research of the staff involved in the present project (leader: M. AUFFRET) focuses on biological responses of molluscs to physiological stress induced by exposure to pollutants present in coastal ecosystems, especially estuaries. Among effects of xenobiotics on physiological systems of benthic invertebrates, especially mussels and oysters, are immunosuppressive responses. Introducing flow cytometry has permitted to develop improved procedures to detect immunopathological alterations and to assess hemolymph cell immunocompetence by standardized assays. The research does associate fundamental investigations and applied ones, especially for the development of ecotoxicological biomarkers. LEMAR is equipped with a flow cytometry platform (FACSCalibur 3C) and is about to acquire a complementary, bench-top system to be moved out the laboratory for field monitoring studies and workshops.

This laboratory has been the leader of a previous CE programme (DISENV FAIR CT 98-4129: Environmental factors and shellfish diseases, 1998-2001 ) and partner in an other one (BEEP EVK3-CT-2000-00025 Biological Effects of Environmental Pollution in Marine Coastal Ecosystems, 2001-2004). It is very much involved in the North-Atlantic Network of Ecotoxicology.

Dr. Michel Auffret will be the scientist responsible for the implementation of the project tasks assigned to UBO/LEMAR

**PARTNER COMMITMENT (to be completed by each partner)****Legal Name: IRIS – International Research Institute of Stavanger**Full address:P. O. Box 8046  
N-4068 Stavanger, Norway

Tel: (+47) 51 87 50 00 Fax: (+47) 51 87 52 00 E-mail : firmapost@irisresearch.no

Undertakes to participate in the following project:

**Response means to chemicals spilled at sea and environmental damage (RESPIL)**Lead by: **IRIS (contact person Dr. Thierry Baussant)**And will be responsible for the implementation of the following actions within the project:  
(Please use Task IDs/ Actions according to the forms T)Task ID A.1 - Project management and reporting to the EC  
Task ID A.3 - Experimental study in laboratory-controlled conditions  
Task ID A.4 - *In situ* validation using a pilot mesocosm study  
Task ID A.5 - Dissemination of data and input to EU guidelines for chemical responses following spill

The foreseen total cost for these actions is: 138,221 €

Our financial contribution to the project is: 66,000 €

Status of financial and technical commitment/s:  definitive  
Please tick applicable box  provisional

<b>Person entitled to enter into legally binding commitments on behalf of the partner organisation</b>	Name: Status/title:
<b>Seal and signature</b>	
<b>Date</b> <b>Place</b>	

**PARTNER COMMITMENT (to be completed by each partner)**

**Legal Name: CEDRE – Centre de Documentation, de Recherche et d'Expérimentations sur les pollution accidentelles (partner 1)**

Full address:

715 rue Alain Colas - CS 41836  
29218 BREST CEDEX 2, FRANCE

Tel: (+33)2 98 33 10 10 Fax: (+33) 2 98 44 91 38 E-mail : contact@cedre.fr

Undertakes to participate in the following project:

**Response means to chemicals spilled at sea and environmental damage (RESPIL)**

Lead by: **IRIS**

And will be responsible for the implementation of the following actions within the project:  
(Please use Task IDs/ Actions according to the forms T)

Task ID A.2 – Selection of chemicals and review of existing data

Task ID A.4 - *In situ* validation using a pilot mesocosm study

Task ID A.5 - Dissemination of data and input to EU guidelines for chemical responses following spill

The foreseen total cost for these actions is: 70,509 €

Our financial contribution to the project is: 35,543€

Status of financial and technical commitment/s:  definitive  
Please tick applicable box  provisional

<b>Person entitled to enter into legally binding commitments on behalf of the partner organisation</b>	Name: Georges PEIGNE Status/title: Deputy Manager of <i>Cedre</i>
<b>Seal and signature</b>	
<b>Date</b> <b>Place</b>	

**PARTNER COMMITMENT (to be completed by each partner)**

**Legal Name: UBO/LEMAR - Laboratoire des Sciences de l'Environnement Marin (UMR6539)**

Full address:

Institut Universitaire Européen de la Mer,  
Université de Bretagne Occidentale,  
Technopôle Brest-Iroise  
F-29280 PLOUZANE, FRANCE

Tel: (+33) 2 98 49 86 44 Fax: (+33) 2 98 49 86 45 E-mail : Laurent.Memery@univ-brest.fr

Undertakes to participate in the following project:

**Response means to chemicals spilled at sea and environmental damage (RESPIL)**

Lead by: **IRIS**

And will be responsible for the implementation of the following actions within the project:  
(Please use Task IDs/ Actions according to the forms T)

Task ID A.3. - Experimental study in laboratory-controlled conditions  
Task ID A.4 - *In situ* validation using a pilot mesocosm study  
Task ID A.5 - Dissemination of data and input to EU guidelines for chemical responses following spill

The foreseen total cost for these actions is: 91,184 €

Our financial contribution to the project is: 49,308 €

Status of financial and technical commitment/s:  definitive  
Please tick applicable box  provisional

<b>Person entitled to enter into legally binding commitments on behalf of the partner organisation</b>	Name: Jean-Claude Bodéré Status/title: President of UBO
<b>Seal and signature</b>	
<b>Date</b> <b>Place</b>	

**CO-FINANCER COMMITMENT (Complete for each co-financer)**

**Legal name:**

Full address:

Tel: ..... Fax: ..... E-mail :.....

Undertakes to co-fund the following project:

Title of project: .....

Estimated amount of co-funding : .....€

Comments (please tick the applicable box):

- The decision to co-finance:  a final decision has been taken.  
 a final decision has not been taken.
- The decision to co-finance:  Is the subject of an agreement in principle? (please specify in writing the conditions).  
 Is not the subject of an agreement in principle.
- Does the co-financing  cover the whole project?  
 is only granted for certain actions? If so, please specify:  
 .....  
 .....  
 .....

<b>Person entitled to enter into legally binding commitments on behalf of the co-financing organisation</b>	Name:
	Status/title:
	<b>Seal and signature</b>
<b>Date</b>	
<b>Place</b>	

## OTHER PROPOSALS SUBMITTED FOR COMMUNITY FUNDING

Please answer each of the following questions:

Have you already benefited from previous co-financing under this program? (project title, reference number, year, amount of the co-financing and duration)

Yes – Grant Agreement N° 07.030900/2005/429172/SUB/A5 – “A pragmatic and integrated approach for the evaluation of environmental impact of oil and chemicals spilled at sea: input to European guidelines” (acronym **PRAGMA** - <http://www.irisresearch.no/pragma>), 2005, duration: 14 months.

The total eligible costs for this action for which the Commission grant was awarded are estimated at 280,492 euros of which the Commission shall contribute a maximum of 133,789 euros.

Have you already benefited from previous EC financing (grants, procurements or loans) for activities that may relate to the present proposal (e.g. an RTD project preceding the present proposal)? (title, reference, year, amount of financing and duration)

1. EUROPEAN COMMISSION, directorate 1- Environmental research : EVK3-CT-2000-00025 “BEEP”; 2001; 161,000 euros

2. Ministère de la recherche française– direction de la technologie: Decision no. 01 G 0765 – ECOPEL; 2001; 35,530 euros; 2 years

3. EUROPEAN COMMISSION – research directorate: NNE5/379/2001 “TRENDS”; 2001; 61,200 euros

Have you applied for Community funding under any other financial instruments for actions which form part of or are directly related to this proposal? With what results? Please give full details.

No

**COMPETENT AUTHORITY SUPPORTING THE PROPOSAL**

**Name:**

**Legal status:**

Full address:

Tel :

Fax :

E-mail :

Undertakes to support the following project:

[fill in project title]

Lead by: .....

Reasons for supporting the project (please specify clearly why and how the competent authority will support this project):

Contact person:

<b>Person entitled to enter into legally binding commitments on behalf of the competent authority</b>	Name: Status/title:
<b>Seal and signature</b>	
<b>Date</b> <b>Place</b>	

**FINANCIAL IDENTIFICATION**

**ACCOUNT**

NAME

ADDRESS

TOWN/CIT  POSTCOD

COUNTR  VAT NUMBER

CONTACT PERSON

TELEPHON  FAX

E - MAIL

**BAN**

BANK NAME

BRANCH ADDRESS

TOWN/CIT  POSTCOD

SORT    ACCOUNT NUMBER

IBAN (optional)

REMARKS :

**BANK STAMP + SIGNATURE BANK REPRESENTATIVE**  
(Both)

**DATE + SIGNATURE ACCOUNT HOLDER:**  
(Obligatory)



EUROPEAN COMMISSION  
DIRECTORATE-GENERAL  
ENVIRONMENT  
Directorate

Brussels,  
DGENV / D

<p>Name of applicant<sup>1</sup>: <b>IRIS</b></p> <p>Contact person<sup>1</sup>: Thierry Baussant</p> <p>Fax<sup>1</sup>: +47 - 51875540</p>
--

**ACKNOWLEDGEMENT OF RECEIPT**

Title of the project<sup>1</sup>: Response means to chemicals spilled at sea and environmental damage (RESPIL)

Sir, Madam

I acknowledge receipt of your proposal for which I thank you.

Your proposal will be examined by our services, with respect to its eligibility. Those projects declared eligible will then undergo an evaluation procedure by the Commission.

I will let you know the final decision, as soon as it has been taken.

Yours faithfully,

Signature DG ENV: .....

\_\_\_\_\_

<sup>1</sup> To be completed by the applicant

# **SECTION T:**

**Objectives,  
actions and  
expected results**

**Project planning  
and structure**

<b>Project Acronym</b>		RESPIL	<b>T1 - Task Form</b>	
<b>Task ID</b>	A.1	<b>Task Title</b>	Project management and reporting to the EC	
<b>Objectives</b>				
<ul style="list-style-type: none"> <li>• Practical arrangements for the implementation of the project</li> <li>• Financial and technical organisation of the project</li> <li>• Communication with EC representatives from the DG Environment</li> <li>• Reporting to the EC following requirements referred in the Grant Agreement between EC and Beneficiary</li> </ul>				
<b>DESCRIPTION</b>				

Action A.1: Project management and reporting to the EC

Description: This action concerns all the practical arrangements and organisation with the partners. It also includes the communication towards EC

Expected results:

- i) Inception and final meetings of the partnership and EC representatives at the DG Environment in Brussels;
- ii) Short progress reports (2) on the project implementation submitted to the Commission at regular intervals over the duration of the project;
- iii) Final technical implementation report (paper and electronic) including summary in partner's languages, evaluation of project implementation process, technical results, recommendations for the EU legislation/guidelines, contribution for the evaluation of the hazards of harmful substances carried by ships for future revision within MARPOL/GESAMP, proposal for follow-up activities in environmental assessment and response to chemical spills;
- iv) Final financial statement of the project eligible costs

Constraints and assumptions: None

Responsible for implementing it: **IRIS** (beneficiary) will have the main responsibility of this action – However, the leaders of each partner will be responsible for the implementation of the tasks assigned to their respective institutes, contribute in the short progress reports and will report on their specific contribution to the tasks/actions accordingly in the final technical report

Action will be subcontracted: No

(see also figure 1 in form A3 for a chart of the project management organisation)

<b>Project Acronym</b>		RESPIL	<b>T1 - Task Form</b>	
<b>Task ID</b>	A.2	<b>Task Title</b>	Selection of chemicals and review of existing data	
<b>Objectives</b>				
<ul style="list-style-type: none"> <li>• Selection of chemicals used in Task ID A.3 and Task ID A.4</li> <li>• Short review of the existing physico-chemical and toxicity data concerning the selected chemicals</li> </ul>				
<b>DESCRIPTION</b>				

Action A.2: Selection of chemicals and review of existing data

Description: The selection of the chemicals should include substances that pose large operational challenges like those that dissolve in the water column or sink to the seafloor since they may represent the highest ecological consequences for the aquatic environment. However, other considerations will be taken (e.g. shipping frequency, reported quantity shipped in European water and dangerousness after MARPOL). In this action, the experience from HASREP (2004), ECOPEL (Le Floch *et al*, 2005) and other published studies will help selecting the most relevant chemicals posing a risk of environmental damage.

Expected results: a list of substances carried by ships in European waters for their use in A.3 and A.4.

Constraints and assumptions: Clearly, the number of substances tested in this project will be limited compared to the one included in IBC or IMDG database. Hence, we will have to select compounds representative or certain classes or groups of chemicals among those posing the largest threat for the aquatic environment.

Responsible for implementing it: **Cedre** (partner 1) will have the main responsibility of this action. The other partners will also contribute in reviewing the existing physico-chemical and toxicological data for the substances.

Action will be subcontracted: No

Project Acronym		RESPIL	T1 - Task Form	
Task ID	A.3	Task Title	Experimental study in laboratory-controlled conditions	
Objectives				
<ul style="list-style-type: none"> <li>• Perform experimental studies with marine bivalves in controlled conditions with the selected chemicals after Task ID A.2</li> <li>• Test the soundness of the proposed “effect” parameters for assessing the environmental impact by analysing individuals during a contamination and a recovery period</li> </ul>				
DESCRIPTION				

Action A.3: Experimental study in laboratory-controlled conditions

Description: After the selection of chemicals is done following the criteria described in A.2, marine bivalves will be exposed to the substances for a period of maximum 2 weeks followed by a recovery period (without chemicals). At the start and end of the contamination period, and at the end of the recovery period, individuals will be sampled and analysed for their “biological health status” compared to a reference group.

Expected results: a selection of response methodologies and their evaluation for the monitoring and assessment of environmental impact following chemical spill at sea.

Constraints and assumptions: We will have to carefully plan the experimental design to represent a possible exposure scenario for the selected chemicals, carefully account for the number of replicates needed to obtain statistically acceptable results. We may have to analyse separately male and female individuals. Also, the exposure period should consider other important intrinsic seasonal physiological changes of the marine bivalves like the period of natural spawning. Hence, the exposure should rather be performed before or after spawning.

Responsible for implementing it: **IRIS** will be in charge of the setup of the exposure system in Akvamiljø’s facility. However, here all partners will be involved in the analytical work regarding chemistry and biological-/ecotoxicological parameters.

Action will be subcontracted: Partially (analytical work related to Immunotoxicity/ Immuno competence methods and Histochemistry/ Histopathology methods)

Project Acronym		RESPIL	T1 - Task Form	
Task ID	A.4	Task Title	<i>In situ</i> validation using a pilot mesocosm study	
Objectives				
<ul style="list-style-type: none"> <li>Perform mesocosm studies with marine bivalves in <i>in situ</i> conditions with the selected chemicals after Task ID A.2</li> <li>Used the proposed “effect” parameters analysed during Task ID A.3. to validate the soundness of the methodologies in more realistic sea conditions</li> </ul>				
DESCRIPTION				

Action A.4: *In situ* validation using a pilot mesocosm study

Description: This action will repeat the exposure schemes used in A.3 with the selected chemicals from A.2 in mesocosm sea conditions (Bay of Brittany, France) where close-to-natural movement of the sea surface after swell, wind and influence of rain or sun will influence the physico-chemical behaviour of the tested substances. At the start and end of the contamination period, and at the end of the recovery period, individuals of marine bivalves will be sampled and analysed for their “biological health status” compared to a reference group.

Expected results: Validation of the response methodologies for the monitoring and assessment of environmental impact following chemical spill at sea. Evaluation for their application in real situation of chemical spill

Constraints and assumptions: See Task ID A.3. Also, we will have to discuss with the local authority in Brittany (France) whether the use of the selected chemicals in mesocosm conditions poses any problem.

Responsible for implementing it: **CEDRE** will have the main responsibility for the organisation of this action, including discussion with local authority. Here again, the staff from all partners will be involved in the experimental setup and the sampling/analytical work.

Action will be subcontracted: Partially (analytical work related to Immunotoxicity/ Immuno competence methods and Histochemistry/ Histopathology methods)

Project Acronym		RESPIL	T1 - Task Form	
Task ID	A.5	Task Title	Dissemination of data and input to EU guidelines for chemical responses following spill	
Objectives				
<ul style="list-style-type: none"> <li>• Analyses of the technical and scientific results obtained after Task ID A.3 and Task ID A.4</li> <li>• Publications of the results in peer-reviewed scientific papers acknowledging the Community financial support and participation to workshop or seminars where appropriate</li> <li>• Creation of a RESPIL website under <a href="http://www.irisresearch.no">www.irisresearch.no</a> for project description, actions follow-up and summary of main project outcomes accessible to the public</li> <li>• Recommendations and proposals for implementing response methodologies following chemical spill into EU guidelines and contribution to future revision within MARPOL/GESAMP'S EHS</li> </ul>				
DESCRIPTION				

Action A.5: Dissemination of data and input to EU guidelines for chemical responses following spill

Description: This action will finalize the project. Beyond the dissemination of the results to the scientific community, the Commission and the public, an evaluation of the practical outcomes for the current guidelines and procedures used in the EU to respond to chemical spills will be made. This action should also enhance the cooperation among Member States through the comparison of the current and proposed methods used to assess environmental damage.

Expected results: Peer-reviewed scientific papers, creation of a website, proposal for implementing methodologies based on analytical measurements of "effect" in marine organisms, in current EU procedures and guidelines

Constraints and assumptions: Even though we expect draft manuscript of the results to be written along with the project, the time frame may be too restricted to allow completed publication in scientific journals. Submission for publication will hence most likely be more realistic than completed publication.

Responsible for implementing it: **IRIS** will have the main role of promoting and disseminating the project data like through the website creation. However the **Partnership** will be involved in scientific papers, workshop participation, proposal for current EU procedures and guidelines

Action will be subcontracted: No

<b>Project Acronym</b>		RESPIL	<b>T2- Task Form</b>		Page 1 of maximum 10 (1 task per page)
<b>Task ID</b>	A.1	<b>Task Title</b>	Project management and reporting to the EC		
<b>Start Date</b>	February 2007 (or following the agreement signature)	<b>End Date</b>	14 months after the start date	<b>Duration</b>	4 months
<b>Deliverable Date</b>	<b>Deliverable Description</b>				
Within 3 months after start	Presentation to the Commission of the project, work and management plans				
3 months following the end date	Final technical implementation report and financial statement				
<b>Milestone Date</b>	<b>Milestone Description</b>				
1 to 3 months after start	Inception meeting at the DG Environment in Brussels				
4 months after start	Progress report 1				
8 months after start	Progress report 2				
You may insert rows if required					

<b>Project Acronym</b>		RESPIL		<b>T2- Task Form</b>		Page 1 of maximum 10 (1 task per page)	
<b>Task ID</b>	A.2	<b>Task Title</b>	Selection of chemicals and review of existing data				
<b>Start Date</b>	February 2007 (or following the agreement signature)	<b>End Date</b>	March/April 2007 (or accordingly)	<b>Duration</b>	1/2 month		
<b>Deliverable Date</b>		<b>Deliverable Description</b>					
March/April 2007		List of selected chemical substances to be used in pilot studies described under A.3 and A.4					
<b>Milestone Date</b>		<b>Milestone Description</b>					
		No specific Milestone for this action					

Project Acronym		RESPIL	T2- Task Form			Page 1 of maximum 10 (1 task per page)
Task ID	A.3	Task Title	Experimental study in laboratory-controlled conditions			
Start Date	April 2007 (or accordingly)	End Date	August 2007 (or accordingly)	Duration	5 months	
Deliverable Date	Deliverable Description					
September 2007 (or accordingly)	First evaluation of response methodologies for chemical spill at sea based on biological markers of "effect"					
Milestone Date	Milestone Description					
April 2007	Exposure setup at Akvamiljø's facility and exposure start					
April/Mai 2007	Exposure period and sampling					
Mai/June 2007	End of recovery period and sampling – End of experimental study					
June – August 2007	Analytical work					

<b>Project Acronym</b>		RESPIL	<b>T2- Task Form</b>		Page 1 of maximum 10 (1 task per page)
<b>Task ID</b>	A.4	<b>Task Title</b>	<i>In situ</i> validation using a pilot mesocosm study		
<b>Start Date</b>	September 2007 (or accordingly)	<b>End Date</b>	Jan. 2008 (or accordingly)	<b>Duration</b>	5 months
<b>Deliverable Date</b>	<b>Deliverable Description</b>				
Feb. 2008	Evaluation of response methodologies and applicability in marine field conditions following chemical spill				
<b>Milestone Date</b>	<b>Milestone Description</b>				
September 2007	Rigging up mesocosm study in Bay of Brittany				
Septemb./Octob. 2007	Exposure period and sampling				
Octob./Nov. 2007	End of recovery period and sampling – End of experimental study				
Nov./ Jan. 2008	Analytical work				

Project Acronym		RESPIL	T2- Task Form			Page 1 of maximum 10 (1 task per page)
Task ID	A.5	Task Title	Dissemination of data and input to EU guidelines for chemical responses following spill			
Start Date	Sep. 2007 (or accordingly)	End Date	3 months following the end date of the project	Duration	4 months	
Deliverable Date	Deliverable Description					
Sep. 2007	Project data on Website					
Feb. 2008	Project data on Website					
April/June 2008	Project final presentation to the Commission representatives					
April/June 2008	Draft manuscript of technical and scientific results for peer-reviewed publications					
Milestone Date	Milestone Description					
Sep. 2007	End of analytical work related to Task ID A.3					
Jan. 2008	End of analytical work related to Task ID A.4					
April 2008 (accordingly)	End of eligible period of the project					

## CONTINUATION

Sustainability of the activities after the project ends:

- What still needs to be done (which actions will have to be continued or maintained)

We foresee four different actions which could be a natural follow up of the proposed project.

**1. Workshop validation of the main project's outcomes**

The economical frame of the proposed project will not allow the organisation of a workshop. However that would be ideally needed to validate the project's results and outcomes against national or international practises and guidelines for response to chemical pollution. The workshop could be a forum of discussion between several organizations for example technical and scientific environmental experts, industry representatives (e.g. aquatic farms and fisheries), environmental agencies, IMO/GESAMP representatives and EU representatives. To some extent, we hope to get international recognition of the project's results through scientific forum participation and publication in international scientific journals.

**2. Pilot study with other species**

In this project, we will limit the implementation of the methodologies to mollusc bivalves since several species are considered "sentinel species" and thereby are often used for the monitoring of environmental damage within this family of organisms. Hence, we have chosen methodologies which are considered to work well with this type of organisms. However, the sensitivity to pollution and the responses measured can vary significantly between the different species. Consequently, it would be ideal to choose one representative species from several classes of marine organism. That could be based on those used in OECD which includes fish and crustaceans. Several other additional methodologies would have to be selected and tested both in the laboratory and in the field accordingly to the type of species selected. Clearly, the economical and time frame limitation of the project can not allow encompassing more than bivalve species in the proposed application.

**3. Ring test**

A frequent problem in the response methodologies to assess environmental damage like in case of marine pollution and the state of recovery is the lack of harmonised procedures and protocols used by the different Member States or elsewhere. This can create differences in output, interpretation of data and final assessment reported to the public, fisheries or aquatic farms impaired by the pollution accident. Here, there is a need to involve a number of Member States to evaluate and compare their methods, and to stimulate cooperation among Member States.

**4. Other cost-effective techniques like biosensors**

In a near future, with the development of new advanced technologies internationally, methodologies based on biosensors should provide a new way of conducting monitoring surveys with tremendous advantages in term of field-applicability, automation and cost. Clearly, in view of the numerous techniques already available today in the field of medicine, food safety etc, biosensors or similar sensing methods hold promise for future environmental monitoring in the marine environment. The project will attempt to use advantage of an on-going project at IRIS (under national funding) to use single-drop biosensors and biosensor array ("bioelectronic tongue") for their application as first-screening response technologies in seawater detection of chemicals and their environmental damage. Using these devices, complex signal analysis using group-selective recognition electrodes together with chemometric analysis can provide, on principle, very informative data of the environmental status and help defining hazard thresholds together with other more classical pollution parameters.

**5. New substances carried in bulk and in packaged form**

New chemicals and substances with a potential hazard for the marine environment will continue to be launched on the European industrial market and hence caused a threat for the environment during shipping at sea. Simultaneously, new advances and progresses are made

by the several laboratories and institutes in Europe and elsewhere involved in environmental matters. Hundreds of papers are published each year which propose implementing new techniques and methodologies with promising application for pollution monitoring of substances spilled at sea. Hence, it is clear that the proposed methods and tools included in this project will have to be updated and possibly changed or extended to even more cost-effective and also more sensitive methodologies adapted to the need. Their outcomes to the EU guidelines will have also to be consequently modified.

- How will this be achieved, which resources will be necessary to continue the actions?
- Who will provide such resources?

Several responses are proposed below

1. The organisation of a workshop will require financial support for the team organising the forum. A “Workshop” action could be applied to the EU next year in the same community framework as the present proposal and in case response to chemical pollution is still in the EU call priority list. Other industrial sponsors could also support this initiative and national funding could also help supporting partly this action.

2. Again, a pilot study with other species would require additional funding which could be sought to the EU-DG Environment next year if relevant or other EU programmes like the 7<sup>th</sup> Research Framework Programme (FP7) which is now launched by the European Union. Research programmes of the Member State’s national research councils could represent another alternative.

3. Programmes to develop quality standards for a wide range of techniques and methods have been initiated under EU funding like QUASIMEME (marine chemistry quality issues) and BEQUALM (Biological Effects Quality Assurance in Monitoring Programmes). These programmes ought to be maintained, focusing on some practical aspects for field application, to improve coordination at European level in the decision-making chain.

4. EU financed projects related to the implementation of the Key action “Sustainable Management and Quality of Water” are supporting initiatives for the development of biosensors and related technologies with the goal to apply them for the implementation of the Water Framework Directive (WFD) (e.g. the EU funded programme SWIFT-WFD – *Screening methods for Water data InFormation in support to the implementation of the Water Framework Directive*). The WFD encompass also the coastal marine environment. Similar initiatives could be launched allowing the implementation of biosensors in the marine environment. An important issue will concern the possibility to automate some of these devices in order to get real-time data samples on an adequate scale of time and space. Also, ring-trials ensuring consistent results among the different users of the Member States should be promoted.

5. An update and follow up of the substances transported by maritime means is currently done in international organisation like IMO. Clearly, the techniques to identify them and the assessment of their toxicological effects to the marine realm will require the maintenance of Member States cooperation e.g. through the creation of an EU/international network that includes scientists, environmental agencies and industrials. Beyond IMO, several other international organisations (e.g. OSPAR, AMAP) are already examining and addressing these environmental issues. At the European level, maintenance of the coordination and attempt to harmonise the guidelines issued by these organisations should be promoted.

- How will the equipment acquired be used?

The GUAVA PCA-96 system is a benchtop analyser applying the principle of capillary flow cytometry. It performs a range of cellular assays including viability, absolute cell counting, target cell expression, membrane stability, phagocytosis, etc...

Partner UBO-LEMAR intends to use this system to detect possible immunotoxicological effects of exposure to chemical contaminants in target organisms. The assays listed above have been set-up by partner UBO-LEMAR in another flow cytometer (FACSCalibur). They are routinely applied by other laboratories (INRS-IAF, Montréal, Canada, Pr M. FOURNIER). Two technical characteristics of the GUAVA PCA-96 system make it a relevant choice for this project:

- it is an automated cell analysis platform for 96-well plates which enables assays to be routinely utilized in biomarker development. In addition, replicate samples will be easily measured to evaluate the reproducibility of the tests.

- the reduced dimensions and weight (35 Kg) make it very easily moved to other laboratories to optimize procedures from animal bleeding to cell analysis.

This equipment will be used during 6 months for biomarker analysis in the following actions within the project:

Task ID A.3. - Experimental study in laboratory-controlled conditions

Task ID A.4 - *In situ* validation using a pilot mesocosm study

- Which personnel will continue to work on the project?

All administrative, technical and scientific personnel involved in this project are working in institutes and universities that are already largely implicated in national or international environmental programmes related to biological effect monitoring, pollution monitoring, impact assessment or technical assistance in the field to fight pollution effects. Cedre is particularly implicated in technical assistance and dialogues with national authorities in an event of chemical pollution. However, the assessment of the environmental damage would have to be done by other relevant institutions like those represented in the partnership. Consequently, it is expected that the same personnel will be involved in a possible continuation of this project through several routes of national or international funding and collaboration.

Rent of Akvamiljø laboratory amount: 33 000 €

The laboratory is operated by a separate company (Akvamiljø a/s) , affiliated to IRIS

We confirm that the amount does not contribute to any overheads or profit payment to IRIS

The Akvamiljø laboratory company is by its company rules not allowed to pay any dividends to its owners.

The Akvamiljø laboratory company budget is scaled only to cover the laboratories own costs.

The laboratory costs are direct costs, mainly:	€
rent of laboratory space/time for test setup (facility rent)	9 023
rent of test system (depreciation and maintenance of test system)	6 316
sea water supply (electricity and other pumping costs)	7 219
waste water removal (depreciation of effluent system & municipal fee)	813
test-operation security (standby duty etc.)	4 517
rent of laboratory space/time for analyses (facility rent)	5 078
round off / miscellaneous unforeseen	34
<b>Sum laboratory costs:</b>	<b>33 000</b>

inputs

based on five months rent of test lab ( 5 months) and analytical lab (4+2,5 months): **Project task:**

rent of test lab duration (months)	5 <b>A3</b>
rent of analytical lab duration (months)	6.5 <b>A3+A4</b>

Calculation monthly			
cost NOK	time months	utilization/share	cost NOK
43 750	5	33 %	72 188
30 625	5	33 %	50 531
35 000	5	33 %	57 750
7 000	7	14 %	6 500
21 900	5	33 %	36 135
43 750	7	14 %	40 625
(costs shared with other projects - part paid by this project )			

**Beneficiary (IRIS)**

**Troels G. Jacobsen** M.Sc. Biology. University of Copenhagen, Denmark

Research Director manager with the responsibility of co-ordinating the research activity and the administration of the Marine Environment group in IRIS. Responsible for the development and implementation of research strategies. Responsible for the individual development of competence for the persons in the group. Responsible for co-ordinating the marketing and the generation of new projects in the group. Extensive experience in environmental aspects related to the offshore industry such as environmental assessment, environmental risk and management systems.

Role: Administrative management of the project

**Thierry Baussant** – PhD. Marine Biology, University Paris VI, France

Expertise: has started ecotoxicological studies through a two-years contract with Elf Petroleum Norge in 1996 on bioaccumulation and biological effect studies related to oil and gas industries. Since 1998, he has a full senior scientist position at RF and since 2006 at IRIS., has a good practical experience in running pilot studies with several chemical substances, project leaders of several subtasks in projects and activities the marine environmental group, is involved in projects regarding the incorporation of biological effects measures in environmental assessment, has implemented bioassay on invertebrates (copepods and mussel larvae) and the use of automatic image analyses for measuring end point parameters, is currently leader of the PRAGMA project funded by DG Environment under the 2005 EU community framework.

Present position in IRIS: senior research scientist

Role: Project leader, will coordinate activities, will be responsible for the organisation of Task ID A.3 , responsible for final report to EU

**Daniela Pampanin** – PhD. Ecotoxicology, University Cà Foscari of Venice, Italy

Expertise: Development of biomarkers and biological effect parameters on marine organisms (invertebrates) related to environmental pollution at sea, has participated in several biomonitoring programmes both in Italy and Norway (BEEP), has large experience in laboratory and field work with bivalves

Present position in IRIS: research scientist

Role: will be in charge of biological marker analyses on bivalves (Immunology and endocrine parameters)

**Nadia Aarab** – PhD. Ecotoxicology of marine ecosystems, University of Bordeaux 1, France.

Expertise: Development of biomarkers and biological effect parameters on marine organisms (both fish and invertebrates) related to environmental pollution at sea and in river, has large experience in laboratory and field work, has participated to several large environmental programmes in France, Norway like BEEP

Present position in IRIS: research scientist

Role: will be in charge of biological marker analyses on bivalves (Histopathology and endocrine parameters)

**Shaw Bamber** – PhD in Marine Biology. University of Wales, UK

Expertise: Development and application of invertebrate biological effect measures, has focused on the development of ecotoxicological testing methods, evaluating the potential of physiological, biochemical and behavioural responses of aquatic invertebrates for use as biological markers of contaminant exposure, is also involved in work related to the incorporation of biological effects measures into risk assessment procedures.

Present position in IRIS: senior research scientist

Role: will be in charge of biological marker analyses on bivalves (Immunology).

**Renee K. Bechmann** – PhD in marine zoology, University of Oslo, Norway.

Expertise: has a broad experience from planning, running and reporting long-term experiments with focus on reproductive effects and biomarker responses in invertebrates and fish exposed to various toxic compounds (oil, oil compounds, endocrine disrupters, metals), has expertise in the Comet assay (a genotoxicity test measuring DNA strand breaks in individual cells) and has used the test on various species e.g. mussels, scallops, sea urchins, and fish.

Present position in IRIS: senior research scientist

Role: will be in charge of the Comet assay analysis (Genotoxicity)

**Atle Nævdal** – High school engineer, Bergen, Norway

Expertise: Since 1998, he is chief engineer within the “marine environment” group with expertise in Chemical and Chromatographic analyses (including GC/MS and HPLC), Oil analyses, Fermentation/microbiology and Ecotoxicological tests (bioaccumulation potential). He is the person in charge of biota, sediment, and water analysis of chemicals by GC/MS

Present position in IRIS: Chief Engineer

Role: will be involved in chemical analyses in the seawater and in biota for task ID A.3.

### **Partner 1 (CEDRE)**

**Georges Peigné.** Engineer in Naval Construction (National Superior School of Advanced Techniques, Paris), 1977.

Deputy Manager of *Cedre*, Georges Peigné is in charge of co-ordinating all Research and Development activities conducted by *Cedre* as well as emergency response by *Cedre* team to any type of accidental water spillage or risk of spillage. In addition, he has been personally involved as adviser in all major oil spills *Cedre* had to deal with. He has participated in co-operation missions, international meetings, training sessions and advised in the preparation of contingency plans and/or in the selection of oil spill control equipment for *Cedre* clients and partners in more than 15 countries.

Role: Administrative management of the project

**Stéphane Le Floch.** PhD. Marine Chemistry, University Bretagne Occidentale, France.

Stéphane Le Floch has been in charge of bioremediation techniques as a shoreline clean-up technique following an oil spill. He thus implemented various field experiments that enabled him to get familiarised with oil chemistry and analytical techniques used to assess of biodegradation activity. In addition, he has an expertise in bioaccumulation and biological effect studies related to oil and chemical pollution. He has already worked with the applicant during a two-years period in Norway at Elf Petroleum Norge. He was largely involved in impact experiments which were carried out by *Cedre* after the levoli Sun Wreckage.

Present Position in *Cedre*: Senior expert, co-ordinator of HNS activities in the R&D Department.

Role: will be the scientific expert representing *Cedre* in the project, will be responsible for the organisation of Task ID A.4

**Jacqueline Arzel.** Master in Biology. University of Bretagne Occidentale, France.

Jacqueline Arzel has been working at Ifremer since 1974. Her experience field consist in the study of nutrient requirements for different fish species. Special studies concern the dietary protein and lipid levels and sources. For October 2004, she's working at *Cedre* in the research and development department where she works on biomarker studies to determine the impact of oil and chemical compounds on marine species.

Present position in *Cedre*: Senior Research Scientist.

Role: she will be involved in the experimental design of Task ID A.4 and will participate in biological analyses.

**Pierre Richard.** Certificate of maintenance of automated installations (Electromechanics).

He joined *Cedre* in 1992, to be in charge of testing, experimentation and development of spill response equipment. Is taking part in all response operations carried out in the field by *Cedre*, in France and abroad. Lastly, he participates in the organisation and implementation of the hands-on exercises during the training sessions carried out on our technical facilities.

Role: he will be involved in the experimental design of Task ID A.4

### **Partner 2 (UBO/LEMAR)**

**Michel Auffret** PhD. in Marine Biology, University of Western Brittany (UBO), France

Expertise: He's interest in possible interaction of environmental factors with the immune status of marine organisms started over 15 years ago. He's present research focuses on the effects of chemical pollutants in bivalve molluscs. He is leader of the immunotoxicology group in the laboratory LEMAR and has been involved in several research projects on the assessment of marine pollution with ecotoxicological tools. He is one of the european representatives for the North-Atlantic Network of Ecotoxicology.

Present position in UBO: professor of environmental sciences (biology)

Role: scientific leader for partner UBO/LEMAR, will participate in the pilot studies (immune status of bivalves)

**Alain Marhic** is an experienced engineer in biologicals sciences at LEMAR and has been involved in many research programmes, including EU programmes. He will be in charge of technical work management for biological analyses.

**Nelly Le Goic** is a technician in biological sciences at LEMAR. She's got a great expertise in flow cytometry and will be in charge of biological analyses.

The **post-doc** fellow to be hired on the project will be in charge of the research in the following tasks:

- "*In situ* validation using a pilot mesocosm study" (Action A.4). He will work jointly with the staff from CEDRE in the experimental setup and the sampling/analytical work on specimens exposed in the mesocosms. For that purpose, the candidate will need a good expertise in biomarker analyses in bivalves molluscs and in exposure protocols.

- "Dissemination of data" (Action A.5)

A support in the action "Experimental study in laboratory-controlled conditions" (Action A3) is expected depending on the timetable of laboratory / mesocosm studies.

Additional documents attached to the application "Response to chemical spills (RESPIL)"

- (1) Foundation of IRIS as a new research company in 2005
- (2) Legal entity form and appendixes ([i] FIRMAATTEST & [ii] REGISTRERING I AVGIFTSMANNTALLET = VAT REGISTRATION)
- (3) Annual activity report (Styrets beretning 2005)
- (4) List of the members of the administration board
- (5) Articles of association
- (6) Profit and loss account and the balance sheet of the last financial year (Årregnskap 2005; Stiftelsen Rogalandsforskning)