keran

Des hommes, une planète

COMPANY PROFILE

International

creocean

Environnement & océanographie

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1 - CREOCEAN KEY POINTS

1.1 KERAN

CREOCEAN belongs to KERAN which provides a global offer in land and environmental development.

KERAN ORGANIZATIONAL CHART

keran
Des hommes, une planète

Holding company wholly owned by Yves Gillet (President) and 5 executives

In charge of:

- The strategy
- The management and synergy of the Group's companies
- The development
- The Innovation and Research
- The common services (finance, staff, information)
- The training and Keran school

Consists of four companies:

sce	creocean	groupehuit	naomis
Aménagement & environnement	Environnement & océanographie	Développement urbain	Systèmes d'information
Turnover 2013 : 30 M€	*Turnover 2013 : 7,9 M€*	*Turnover 2013 : 2 M€*	*Turnover 2013 : 1,2 M€*
Headcount : 380	*Headcount : 63*	*Headcount : 10*	*Headcount : 20*
(100 % of the capital)	*(95 % of the capital)*	*(95 % of the capital)*	*(100 % of the capital)*

4 international subsidiaries:

- GROUPE SCE Algeria
- GROUPE SCE Morocco
- GROUPE SCE Middle East – Qatar
- Odisea Consulting – Romania

3 offices:

- KERAN UK
- KERAN Vietnam
- KERAN China

1.2 CREOCEAN's background and commitment

1.2.1 History

KEY DATES:

1948	Creation of the CREO association: Center for Research and Oceanographic Studies
1980	CREO becomes a limited liability company
1984	IFREMER holds a part of the CREO Ltd company's capital
1987	Creation of ECOCEAN by Jean-Marc SORNIN
1991	Merger / absorption of CREO and ECOCEAN giving CREOCEAN
1997	IFREMER sells its shareholding to ITI group (SCE / FIT / SNEDA)
2003	Creation of GROUP SCE which acquires 95 % of CREOCEAN capital
2014	New identity of the Group SCE becoming KERAN

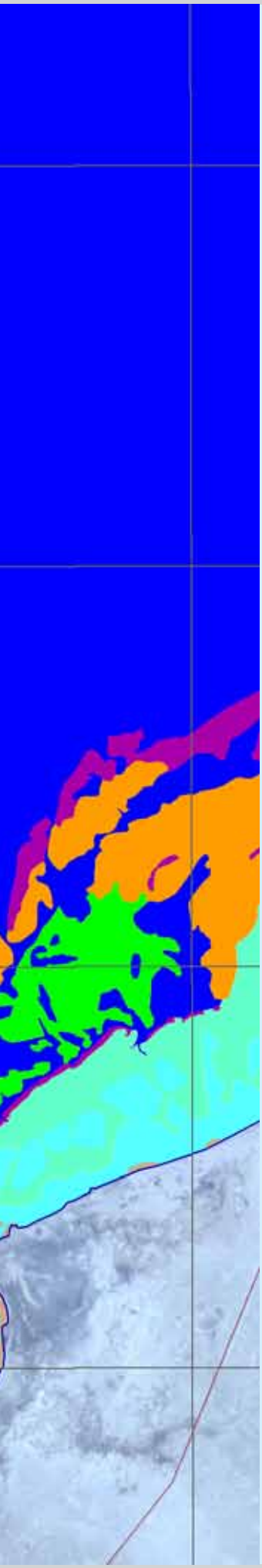
More than 60 years after CREO's creation, we are proud to carry on this legacy: respecting scientific ethics, we uphold the idea that multidisciplinary skills are necessary for the understanding of coastal and offshore marine environments. During all these years, while following technical and scientific advances, we also evolved with changing societies within the framework of Sustainable Development.

1.2.2 Commitment

Coastal development is ever increasing and remains a major concern all over the world. It is widely recognized that the development of urban, industrial, agricultural or touristic activities close to or in the marine environment needs to be managed in accordance with the principles of environmental conservation.

Based on its long-term worldwide experience and multidisciplinary scientific approach, CREOCEAN has nurtured a functional vision of Sustainable Development in coastal areas.

CREOCEAN's commitment is to provide science-based decision-making tools for the Sustainable Development of coastal activities in harmony with humans and their natural surroundings.



For each of our projects, the solutions CREOCEAN provides attend three main concerns :

- The preservation of human and natural legacies: threatened and endangered species, biodiversity, and the integrity of coastal and underwater ecosystems require sound management practices to ensure the sustainable use of natural resources

- The harmonious development of coastal activities: each urban, port, industrial, agricultural or touristic development may affect surrounding resources and activities. CREOCEAN endeavors to prevent harmful impacts and conflicts between different activities by drawing on rational management of coastal and marine resources.

- The development of sustainable facilities and activities: coastal resources and habitats have specific characteristics that must be taken into account with each new project. The success of some of these activities requires that natural resources be kept in pristine condition.

Since its inception, CREOCEAN has conducted scores of projects linked with coastal and offshore environments. CREOCEAN has gathered and processed data, conducted baseline assessments and monitored resources, and carried out impact studies as well as a multitude of environmental analyses.

Thanks to its mobility, multidisciplinary expertise, decades of experience, and an extensive professional network, CREOCEAN can listen to, understand, and meet the requirements of its customers. In doing so, CREOCEAN continues to develop its legacy of long-term relationships based on satisfied customers.

1.2.3. CREOCEAN HSE's policy

HEALTH SAFETY ENVIRONMENT
OUR PRIORITY

HEALTH SAFETY ENVIRONMENT
The CREOCEAN Charter

CREOCEAN is committed to carrying out its projects in an environmentally-responsible and people-friendly manner. In order to achieve this goal, our policy relies on the following ten principles :

1. For us, the health and safety of individuals and protection of the environment take priority over all other considerations.
2. All currently applicable laws and regulations must be complied with in full.
3. Health, Safety and Environment risk prevention procedures must allow such risks to be reduced to an acceptable level in all our activities.
4. Methods designed to manage emergency situations must be implemented and followed in ll situations.
5. The use of substances that are harmful to individuals and the environment must be avoided, and waste and pollutant products kept to a minimum.
6. Our choice of partners must ensure our Health, Safety and Environment values are respected.
7. The provision of training, keeping our staff informed, and encouraging dialogue and feedback will help us to improve our performance.
8. Every member of staff, regardless of their position in the company, must guarantee that these principles will be upheld.
9. The adoption of national and international best practices will help us to improve our management system.
10. In-house and external communications relating to our Health, Safety and Environment results and objectives must always be transparent and accurate.

Jean-Marc SORNIN
President and CEO

1.3 CREOCEAN in France

CREOCEAN has agencies on the coasts of France and in French overseas territories. CREOCEAN's headquarters are in La Rochelle (West-central France) and its other agencies are in Montpellier, La Seyne-sur-Mer, Nantes, and Caen. Overseas agencies are located in Martinique, Guadeloupe, Tahiti, and New Caledonia.

1.4 International development

CREOCEAN supports its international presence and projects with agencies/subsidiaries in the Middle East (Doha-Qatar; Abu Dhabi-UAE), in North Africa (Casablanca-Morocco),
in South-America (Salvador de Bahia- Brazil) and in South-East Asia (Indonesia) where it has a partnership with the Company Mahakarya Geo Survey (www.mahakarya.co.id). CREOCEAN has conducted projects across the globe in the following regions :

- Mediterranean Sea
- North and South Atlantic Ocean
- English Channel
- North Sea
- Caribbean Sea
- Red Sea
- Indian Ocean
- Pacific Ocean
- Arabian Gulf
- South-East Asia

1.5. Engineering qualification (OPQIBI)

Since June 2008, CREOCEAN has been awarded OPQIBI certificates.

The OPQIBI is an independent body accredited by COFRAC (French Accreditation Authority), issuing qualification certificates to companies providing primary or secondary engineering services in the following sectors :

- Construction
- Infrastructures
- Energy
- Environment
- Industry

The certificates CREOCEAN has obtained include :

0103 - Technical assistance to the contracting authority
0604 - Environmental assessment of industrial activities
0612 - Environmental assessment of projects, works and facilities
0701 - Study of ecosystems. Assessment of flora and fauna
0810 - Assessments in river or marine settings
1003 - Geological studies
1821 - Engineering of channels, riverside construction, water flow, currents in harbors

OPQIBI
L'INGÉNIERIE QUALIFIÉE
CERTIFICAT N° 08 06 1985

2 - CAPABILITY STATEMENT

With a project-based approach, we are committed to delivering a high and best quality level expertise regardless of its size or complexity.

Our specificity is, thanks to a large oceanographic tool box, to propose adapted environmental approaches to each project, taking into account its specificity (nature of the project, environmental characteristics of the area) and the client's needs (through its own procedure or through the regulatory process). We can intervene at an early stage of any industrial or coastal development project to help the owner to develop its activity through an environmental friendly manner and throughout the project life.

Indeed, with a team of 60+ employees, CREOCEAN conducts applied projects as well as Research and Development in biological, ecological, geological, chemical, and physical aspects of coastal and marine environments. Our teams are supported by powerful tools for the acquisition of field data and data processing which in turn offer the most appropriate solutions to our customers.

Our customers include public entities such as local and regional authorities, state organizations (Ministries of Environment, Directorates of Planning and Environment, IFREMER – French Research Institute for Exploitation of the Sea) as well as small and large private companies including TOTAL, SHELL and EXXON MOBIL.

Our services cover all stages of a project from the assessment of an area's potential to the implementation of compensatory environmental measures after its development. CREOCEAN is also involved in several Research & Development studies.

2.1 Physical properties, marine habitat mapping, and biodiversity assessment

At an early stage of any development project, preliminary data are necessary to know the potentiality of the area for the project and the physical and natural constraints if any. Such feasibilities studies include the need for oceanographic, hydrodynamic and metocean data, seafloor and sub-bottom knowledge, ecological habitat mapping and biodiversity assessments.

2.1.1 Oceanographic and metocean data gathering

CREOCEAN is able to efficiently acquire and process oceanographic and meteorological data to determine the physical characteristics and constraints of study sites. These data can also be used to define characteristics of coastal or offshore areas for planning purposes and before the installation of an infrastructure.

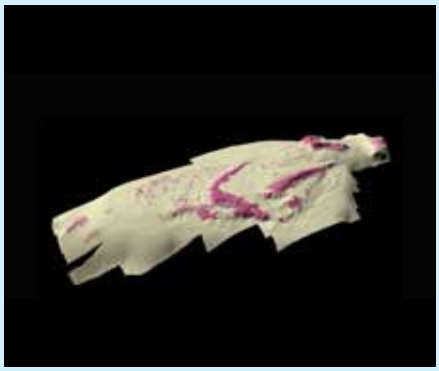
The equipment CREOCEAN owns and operates including current meters, 2D and 3D modeling software, allows the measurement of a wide range of physical parameters such as swell, currents and weather conditions.

CREOCEAN has provided such data in support of the construction of ports, dredging projects, the laying of submarine pipelines, construction of sea outfalls, the installation of offshore wind farms and marine power generating units, and for projects addressing shoreline erosion and/or accretion.

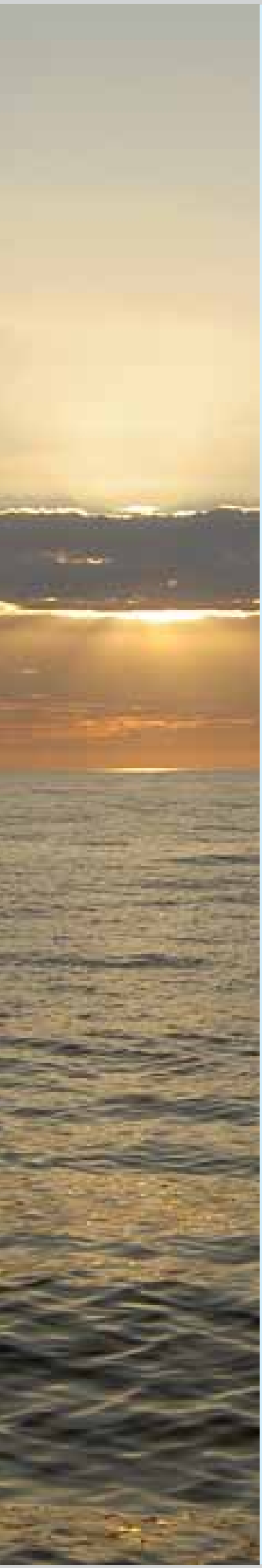
2.1.2 Seafloor and sub-bottom mapping

CREOCEAN provides expert services in subsurface geophysics and seismic acquisition and interpretation.

CREOCEAN owns and operates state of the art geophysical equipment for seafloor and sub-bottom mapping including side scan sonar, multibeam echosounder, and seismic very high resolution sub-bottom profilers.



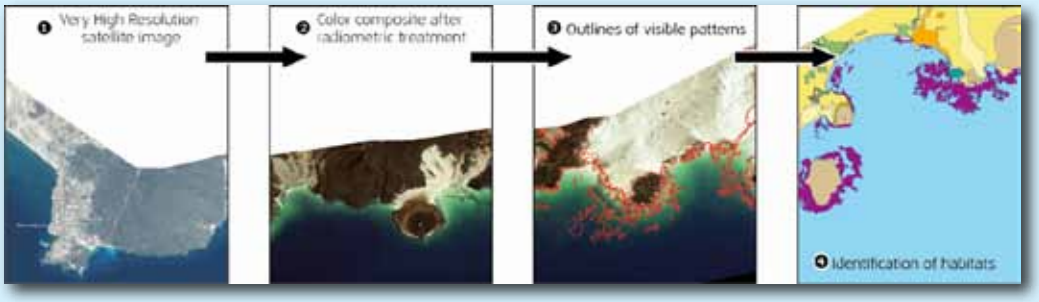
CREOCEAN draws from this substantial array of mapping tools to perform bathymetric, geological, geophysical, sedimentological, habitat characterization, and environmental diagnostic studies in support of any type of offshore, coastal or port development project.



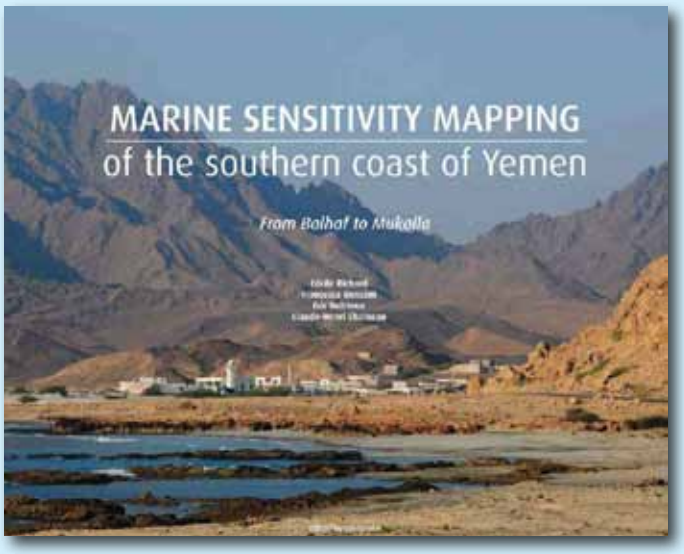
2.1.3 Marine and coastal habitat mapping and biodiversity assessment

The ecological characteristics and sensitivity of an area increasingly impose constraints on any industrial, touristic or urban development project. It can also be very positive for touristic developments of an area as rich and diversified areas attract more and more tourists. Areas with high ecological value have now high economic value.

The approach developed by CREOCEAN allows the identification of these very valuable areas by associating satellite image processing and interpretation, and field work expertise including diving, underwater photography and in situ observations and biota description.
From the ecological maps produced, can be proposed sensitivity maps easily understandable by decision makers, although they are based on scientific data. Such a Sensitivity Atlas is a very important tool for those who need to decide which area should be protected or developed.
Users are private companies (Oil & Gas for example for their Oil Spill Contingency Plans) or governments through their Ministry of Environment.



When the more sensitive or rich areas are identified, it can be necessary to describe more precisely the composition of species. CREOCEAN has the knowledge and state of the art equipment to conduct both preliminary and comprehensive biological inventories (open water and seafloor fauna and flora, marine habitats). Collaboration with researchers allows identifications of most groups of species to the species level.



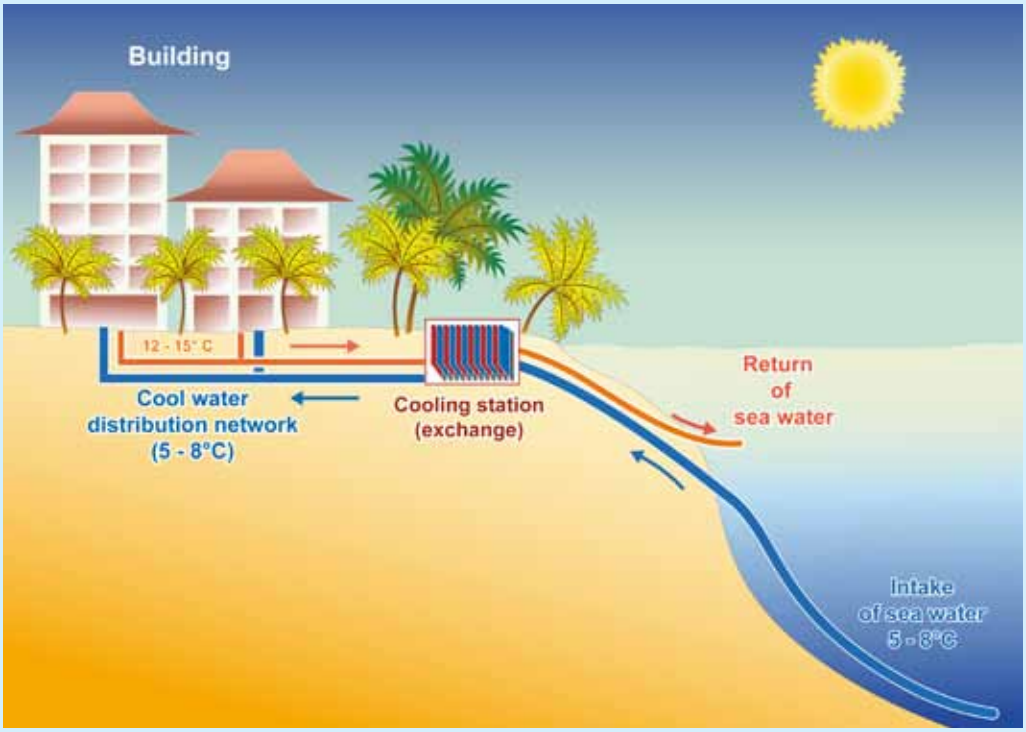
2.2 Coastal Engineering

Based on the potentiality of the area, CREOCEAN can size, design, and implement infrastructures taking into account global constraints from currents, tide, wave motion, sediment transport and nature of the seafloor to environmental, regulatory, technical, legal, and financial constraints.

CREOCEAN engineers carry out coastal management projects such as protection works against erosion and coastal flooding, dikes, restructuring of beaches or waterfront and the development of commercial, fishing and recreational ports.

Furthermore, CREOCEAN engineers design the installation of offshore pipelines for outfalls of water treatment plants, drinking water, and the pumping of cooling water as well as the installation of waterfront and offshore facilities exposed to natural conditions.

CREOCEAN assists clients during all phases of projects including preliminary studies (diagnostic, strategic, and feasibility studies), design studies (draft, project), consultation with companies, and construction work project management.



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2.3 Environmental baseline and impact studies

Environmental and Social Impact studies (ESIA) are, in most cases, a regulatory process which is required by the governmental authority in most countries today. In addition it can be required by the institution financing the project (World Bank for example) or even be part of the project owner company internal procedures.

These approaches generally require two main steps which are the Environmental Baseline study (EBS) and the ESIA itself. Some complementary studies are sometimes necessary such as hydrodynamic modeling.

2.3.1 Environmental Baseline Studies (EBS)

CREOCEAN has developed all the necessary techniques to perform EBS. A scope of work is site and project-specific and needs to be adapted case by case. Tools developed by CREOCEAN allow to work for any project and in any site, from very shallow areas (lagoons, mangroves, coral reefs) to deep offshore seafloors.

Typically, baseline studies can include the description and analysis of the following environmental characteristics which are all implemented by CREOCEAN :

- Metocean data acquisition,
- Water measurements (hydrodynamics, chemistry, biology),
- Sediment analysis (chemistry, trace metals, hydrocarbons, pollutants),
- Hard or soft bottom fauna description including corals, seagrass, mangroves, sessile fauna, macrobenthos, meiofauna, etc.
- Fish and fisheries,
- Marine mammals, turtles and birds,
- Detailed mapping of the study area,
- Sensitivity evaluation.

CREOCEAN's in-house expertise is supported by a wide range of instrumentation and sampling equipment for marine biological studies including grabs, nets, CTD probes, sampling bottles, SCUBA equipment, ROV, video, and a PAM Fluorometer (Pulse Amplitude Modulation).

This proven capability will generate the data required for the environmental impact assessments such as those for dredging, disposal of dredged material, submarine pipe laying, wastewater outfalls, Oil & Gas projects, marine aggregates exploration and production, aquaculture, offshore wind farms or marine energy production units.

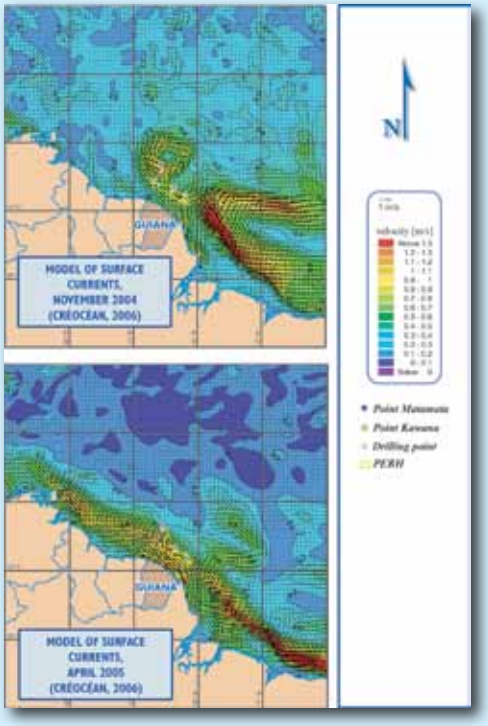
2.3.2 Environmental and Social Impact Assessments (ESIA)

CREOCEAN has a wealth of experience and expertise in preparing regulatory and compliance documentation. Furthermore, CREOCEAN provides the technical expertise to thoroughly determine the environmental consequences of a proposed activity and to develop the necessary project monitoring.

When required, CREOCEAN uses the World Bank standards IFC N°6 which was already applied to some large industrial projects like the Shell exploration project offshore French Guiana.

2.3.3 Complementary studies: hydrodynamic modeling

During the process of the EIA, CREOCEAN can implement complementary studies aiming to generate information on the fate of any discharged substance.



One such study is the implementation of hydrodynamic models. CREOCEAN has extensive expertise with modeling physical processes in coastal and offshore areas, in addition to estuaries, rivers and lakes. This modeling capability allows our clients to forecast and manage dynamic systems.

CREOCEAN has developed a large range of models and can produce 2D and 3D models, currents and agitation simulation models, sediment transport models, advection and contaminant dispersion models.

CREOCEAN provides different types of applications: circulation models of coastal waters in order to evaluate the impact of wastewater outfalls on marine water quality, harbor oscillations used to design coastal structures, defense works or offshore wind farms, marine submersion models to define overland flooding (within the framework of plans for risk prevention, risk studies to define protection works), hydrodynamic and water quality modeling for coastal development or to assess the impact of coastal infrastructures on water quality and sediment processes, oil slick drifting model in case of oil spill.

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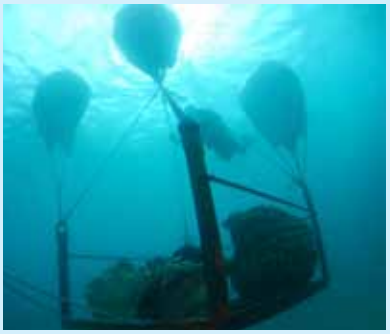
2.4 Implementing mitigation measures

CREOCEAN can advise the client how to minimize the impact of a project during its construction or operation. These recommendations can be part of the EIA and proposed in the Environmental Management Plan but can also be decided during the project life according to the observed effects or risks. According to interactive discussions with the client, these mitigation measures can then be designed and implemented.



These measures are project-specific and can't be detailed here but they can range from small recommendations as improvement of construction methods statement to major proposals as physical protection of ecosystems or marine habitats (for example installation of silt curtains to protect corals against turbidity plumes), or relocation of sensitive species to a safe place. As an example, CREOCEAN has a large experience in relocating corals from areas where they are threatened.

To develop these measures, CREOCEAN uses all of its tool box and team of experts ranging from engineering experts for the design of any system to the ecologists. Again this multidisciplinary approach is specific to CREOCEAN.

2.5 Monitoring performance

During the life of a project it is necessary to monitor the efficiency of compensation measures. These monitoring measures the performance of the environmental compliance of a project owner. Monitoring can also be applied to natural control areas such as Marine Protected Areas that could be threatened. Conversely, the monitoring results can help identify the sources of impacts and be used to propose measures that limit their effects.

CREOCEAN provides all the tools and expert services for such environmental monitoring and auditing. Marine investigations, for instance, can involve the identification and characterization of effluents, determination of pollutants and their environmental effects.

Monitoring of mangroves, coral reefs, seagrass beds or hard and soft bottom fauna (benthos) are considered as the main ecological targets as they form part of the biological richness and biodiversity. In addition to these biological compartments, the identification of the threats is conducted thanks to CREOCEAN's expertise in chemistry, toxicology, physical oceanography, and modeling. This offers a very comprehensive set of skills suited for environmental investigations such as those required in the petrochemical industry, mining, marine aggregates extraction, water treatment / desalination, and the discharge of liquid or solid effluents.
CREOCEAN can also offer comprehensive toxicity testing services for routine monitoring and assessments in marine environments.

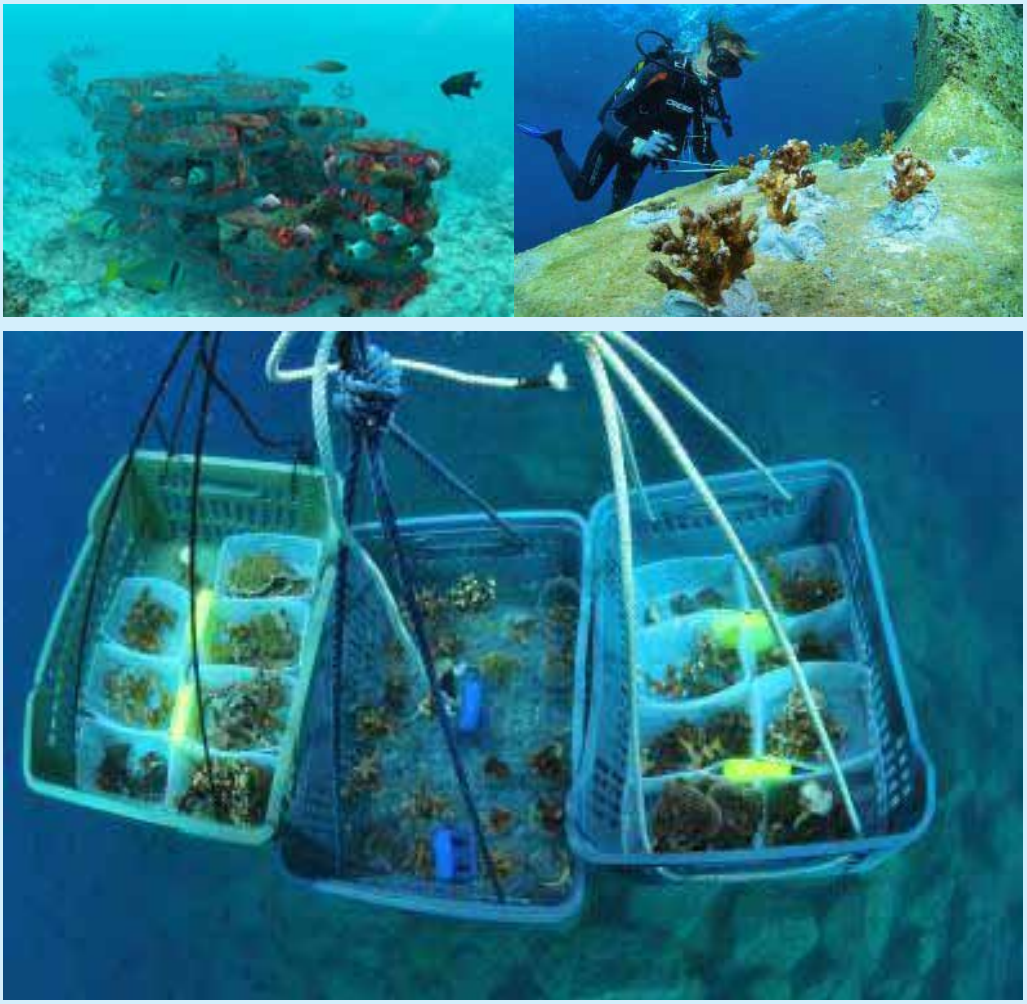
2.6 Ecological compensation

Due to project residual impacts, or due to unexpected marine habitat damage including naturally-occuring diseases, it can be necessary to restore the ecological value of an area and especially its biodiversity, richness and ecological functionality.

CREOCEAN has developed various methods adapted to such situations. These methods are for example related to mangrove and seagrass restoration, coral replantation and artificial reef development.

These operations are considered as ecological engineering as they combine engineering expertise (designing of artificial reefs as an example) and of biological expertise.
In some cases, expertise in sedimentology, hydrodynamics and chemistry is also necessary.

The specificity of CREOCEAN, by being able to bring together all these experts, is then to reach the completion of truly integrated projects. For example, the same artificial reefs can be efficient not only for increasing biodiversity but also for protecting the shoreline against erosion.



2.7 Research and Development: continuously improving tools and methodologies

CREOCEAN uses state of the art oceanographic tools and acquires the best performing equipment. However, some projects require specific tools not yet commercially available or that have yet to be developped. With its Research and Development department and team, CREOCEAN develops new tools related to various applications in cooperation with other academic institutions.

Our R&D team has, for instance, developed a monitoring tool for coral and other biota : the Diving PAM (Pulse Amplitude Modulation) for the monitoring of coral health at a very early stage, even before any visible condition such as bleaching. CREOCEAN developed the application of this technique and performed all the required field work to implement the methodology at a large scale.

Through long term collaboration with universities, CREOCEAN also helps develop modern techniques for taxonomy such as DNA analysis. CREOCEAN has for example collaborated with Milano-Bicocca University for coral studies and with CEAB/CSIC in Blanes (Spain) for soft bottom fauna taxonomy.

All these works conduct to various scientific publications or even some books available to the scientific community.

3 - STAFF AND ORGANISATION

CREOCEAN employs over 60 people including more than 40 experts representing all areas of marine science.

CREOCEAN is organized in four groups of experts each managed by a Program Director :

- COASTAL DEVELOPMENT
- OFFSHORE PROJECTS / GEOSCIENCES
- ENVIRONMENTAL STUDIES IN THE ATLANTIC OCEAN, ENGLISH CHANNEL AND NORTH SEA
- ENVIRONMENTAL STUDIES IN THE MEDITERRANEAN SEA AND TROPICAL AREAS

Projects are assigned to a team of CREOCEAN experts and a project manager best suited to address project-specific requirements. The project manager is the unique customer contact.

3.1 Direction

• **Jean-Marc SORNIN** - *President and CEO*

Doctor in Marine Geology (1981), University of Nantes, France. He spent two years as an engineering advisor for the company SCE followed by four years as a scientific researcher for IFREMER (French Research Institute for the Exploitation of the Sea). In 1987 he created the company ECOCEAN, specialized in the study of environmental impacts on marine and coastal areas. From 1991 to 1997 he was the technical and commercial director of CREOCEAN after which he became General Manager and then in 2004, President and CEO.

Being very fond of international collaborations, he was a founding member in 1997 of EUROPHAR (European Economic Interest Group) and was appointed to the position of Advisor to the French Foreign Trade in 2005.

Conscientious about developing relations between research institutes and private companies, he was nominated in 2005 as a member of the Scientific Board of the University of La Rochelle, France, where since 2008, he also is a member of the board of directors.

• **Eric DUTRIEUX** – *General Manager - Business and Technical Development*

Graduated from high school in Agronomy (1984) and Doctor in Marine Ecology (Science PhD, 1989). His main expertise is in benthic ecology (soft and hard bottom substrates), including the study of coastal aquatic environments such as lagoons and mangroves.

He joined CREOCEAN in 1998 and developed two agencies on the Mediterranean coast (Montpellier and La Seyne-Sur-Mer).

His experience in international consulting brought him to develop several projects in the Persian Gulf, and in 2006 he undertook the responsibility of establishing a CREOCEAN office in the Middle-East.

From 2004 to 2012, he was head of the Environmental Monitoring and Management Department which consists of twelve PhDs and experienced engineers, conducting studies abroad.

In 2010, he became Director of International Development. Since January 2013, he is General Manager of CREOCEAN in charge of business and technical development.

He has international experience in the organization, management, and environmental evaluation of coastal regions, with specific experience in the assessment of impacts of industrial installations in coastal settings (harbors, oil and gas operations) as well as the restoration/rehabilitation of coastal and marine environments. He is an experienced lecturer and instructor, and has trained staff ranging from environmental technicians to engineers.

Commercial diver, he is the author of over 100 technical reports and publications on marine ecology, water pollution assessments and the management for coastal areas. Furthermore he authored five books on marine ecology and SCUBA diving, including a dozen non-technical journal publications on underwater exploration and the world of SCUBA diving.

3.2 Project Directors

• **Georges CLAVERIE** – *Director of Coastal Development projects*

He received a diploma from l'Ecole Centrale de Nantes (French Engineering highly selective establishment) (Grandes Ecoles) in 1984, with a main expertise in Marine Engineering. He started working as project manager for CREO from 1986 to 1987. Starting in1987, he was responsible for feasibility and design studies and for the monitoring of port or coastal structures, pumping stations and outfalls. He also conducted studies of coastal and port hydrodynamic processes and designed measuring equipment. During his career, he conducted more than 300 projects involving coastal structures.

From 2004 to 2012, he was the head of the Hydrodynamics and Engineering Department consisting of a team of five engineers and PhDs. In 2013, he became Director of Coastal Development projects department.

• **Michel COLINET** – *Director of Offshore projects – Geosciences*

He holds a Postgraduate diploma in Geosciences with an emphasis on inshore and offshore equipment, University of Bordeaux (France, 1994). He joined CREOCEAN in 1996. After having spent 5 years as an Engineer in La Rochelle, he spent 2 years from 2001 to 2003 in CREOCEAN's PACA (Provence Alpes Côtes d'Azur) agency in the South of France. In 2003, he founded and took the responsibility of the CREOCEAN Caribbean agency through 2007 when he founded and became head of CREOCEAN's Pacific agency in Tahiti until the summer of 2011. He is now Technical and Commercial Coordinator of the 3EM (Assessment and Studies in Renewable Marine Energy), EIG founded by CREOCEAN and is, for that reason, CREOCEAN's expert for all matters related to Renewable Marine Energies. In January 2013, he also became Director of offshore projects department.

• **Philippe GUIBERT** – *Director of Environmental Studies - Atlantic, English Channel and North Sea*

Philippe GUIBERT earned a Master's degree in oceanography, University of Marseille, France (1981) followed by a post-graduate diploma in marine ecology, Orsay Paris Sud, France (1982), and a post-graduate diploma in public relations for Environment, University of Paris VII, France (1986). He started working as a marine biologist for short term contracts before being employed full time by CREOCEAN in 1990. His activities gradually evolved to marine ecology and he has been for many years head of the Statutory and Environmental Impact Assessment Studies Department consisting of a team of seven engineers. He has led or participated in more than 280 environmental studies (development projects and related management of marine sites) giving him a wide experience, allowing him to work on a variety of projects, ranging from environmental to impact studies. He and his team mainly work around the Atlantic and Channel Coast of France, but have also taken part in specific projects abroad including the Middle East and Caribbean. He became Director of Environmental Studies – Atlantic, English Channel and North Sea department in January 2013.

• **Sébastien THORIN** - *Director of Environmental Studies – Mediterranean and tropical zones Head of Research & Development*

Sébastien THORIN conducted Post Doctoral studies in Marine Ecology at the University of Rennes, France (2 years), he holds a Ph.D. in oceanography, University of Rimouski, Canada, (submitted in 1998, with excellence), a Post-graduate diploma (1 year) in «Adaptation and survival in extreme environments», University of Lyon I- Aix-Marseille II, France, 1993 (Major) and a Master of Science, Organisms and Populations Biology, Ecology and evolutionary Biology, University of Rennes I, France, 1991.

He began his career as a scientific guide and organized SCUBA diving visits of marine communities and aquaria. Then, he specialized in neurophysio-pathology. He studied consecutively ecological function of coral reef, ethology, bio statistics and benthic ecology. He conducted two years of research on the marine trophic network of the Mont-Saint-Michel-Bay at University of Rennes (France).

He joined CREOCEAN in 2000 as project manager specialized in the management of marine ecology. He became head of the Research & Development in 2012 and Director of Environmental Studies for Mediterranean and tropical zones department in January 2013.

3.3 CREOCEAN in the world

3.3.1 Headquarters

In the early 1970s the Centre for Research and Oceanographic Studies (CREO) moved from Paris to La Rochelle.

Nearly 30 years later, located near La Rochelle marina on the waterfront, the buildings were destroyed by the storm Martin in December 1999. After a transition period in temporary offices, during the construction of a new building, the CREOCEAN headquarters were constructed in July 2004 on their present site near the fishing and the cargo ports north of La Rochelle.

Under the responsibility of its President and CEO, Jean-Marc SORNIN, the building, comprising three levels, houses the management, sales and administration and much of the scientific and technical personnel team.

Almost all the skills of the company are present in La Rochelle and may provide support to French, overseas or international agencies, when needed.

3.3.2 Caribbean zone

CREOCEAN Caribbean agency was created in 2003 in Martinique. Moreover, to ensure close contact with its customers, a branch was opened in Guadeloupe (Baie Mahault) in March 2011. Jean-Damien BERGERON, a trained biologist and a specialist in marine ecosystems, is the head of this agency.

The local team consists of four people having complementary expertise in the areas of coastal development, environmental and regulatory studies but also uses experts located in France for other skills including geophysical aspects of the implementation of offshore projects.The agency conducts many missions in Martinique, Guadeloupe, French Guiana and in Caribbean islands (St. Lucia, Dominica, Saint-Martin, Montserrat...).

The main competencies of the agencies include project management (port development, waterfront ...), dredging issues, diagnostics (coastal, port ...) and surveys at sea (sampling, measurement, diving) in order to identify and assess the ecological values of the marine environment in the Caribbean area (framework directive on water, monitoring of the marine environment...).

The agency's clients are local authorities (district councils, counties, departments, regions...), major seaports (Martinique, Guadeloupe and French Guiana) and also private entities (manufacturers, developers, hotels...).

3.3.3 Pacific zone

After ad-hoc interventions led by CREOCEAN in the territory of French Polynesia, Pacific CREOCEAN agency was created in 2007.
Directed by Julien GUILLET, Engineer in coastal and marine environment, who joined CREOCEAN in 2002, the agency has been involved in all areas of CREOCEAN's expertise, with, if needed the CREOCEAN staff in France, involved either remotely or in the field in French Polynesia.

The core competencies of the Pacific agency include:

- Coastal development design,
- Data acquisition: seabed mapping, swell and current measurements, diagnostics and monitoring of biological communities, water quality...,
- Marine Renewable Energies: prospective studies and design projects (SWAC),
- Environmental Studies and Development.

The main client of the agency is the Territory of French Polynesia through its various entities (Environmental Regional Direction (DIREN), Ministry of Equipment, Energy Department...). The agency also works for the Community of Communes of the Marquesas Islands and for Municipalities and private companies in the area.

3.3.4 North Africa

CREOCEAN Morocco office was open in 2006 in Casablanca to deploy our services and expertise locally. Romain LE GALL is managing the office since 2011. He is a marine ecologist and professional scuba diver who joined the company in 2006 in Qatar where he managed several projects related to Oil & Gas and dredging sectors.

In Morocco, CREOCEAN has been working mostly on topics related to the maritime development (port development, maritime signalization, Environmental Impact Assessment, Environmental baseline survey (EBS) …), and sewage treatment plants (EBS and monitoring). Our goal is to provide the local market with high standard studies by implementing our network of experts and prequalified laboratories to our clients.

We are presently working closely with local authorities (DPDPM, ANP...), major seaports (TMSA, NWMED, Jorf Lasfar), local water boards and we are seeking to expand our industrial clients.

3.3.5 Middle East

CREOCEAN has been based in the Middle East since 2003 with the opening of an agency in Doha, Qatar which was followed by another agency in Abu Dhabi in 2008. These agencies are currently managed by Edouard HÖRLIN since 2009; he is a marine biologist and professional scuba diver who has managed several projects in the region covering various sectors such as the Oil & Gas industry, dredging, coastal impact studies, monitoring campaigns and coastal mappings.

The core of the business has been centered on Environmental Baseline Surveys (EBS) and environmental impact assessments (EIA) for the offshore and coastal environments of the Gulf. These studies have led to a wide knowledge of the local environment and its contributors from Oil & Gas companies to dredging and construction companies. The main aims in these surveys were to assist and assess the possible impacts related to the marine environment and how we could assist the various actors in reducing their impacts. In addition to these, CREOCEAN undertook for the Ministry of Environment (MoE) of Qatar a large scale mapping of the coast, which consisted in remote sensing and ground truthing surveys. We have taken part in several research and development projects with ExxonMobil since 2009 related to the coral reef and seagrass ecosystems along the coastal waters of Qatar, these studies have allowed us to gain even more knowledge and develop news tools for use in future projects around the world. Finally, CREOCEAN is active in the field of coral transplantations linked to the development of projects in the Gulf.

CREOCEAN works in close collaboration with local authorities such as various ministries as well as multi-national companies developing projects in the region. We are always looking at expanding our list of clients and are looking to broaden our horizons to the other countries of the Gulf Cooperation Council (GCC).

3.4. Experts and technicians

CREOCEAN uses a pool of subject-matter experts and technicians that can be deployed across the globe on short notice:

- Oceanographers and experts in marine hydrodynamics and numerical modeling
- Marine engineering, civil engineering, and coastal engineering experts
- Coastal development engineers
- Marine environmental impact assessment analysts
- Marine biologists
- Marine ecologists
- Integrated management of coastal and marine environments engineers
- Geologists
- Geophysicists
- Sedimentologists
- Hydrobiologists
- Chemists
- Toxicologists
- Hydrographic data acquisition and processing experts
- Cartographers, graphic designers and illustrators
- Professional SCUBA divers
- Land and underwater photographers and videographers

4 – TECHNICAL CAPABILITIES

4.1. Physical oceanography and modeling

Our competencies :

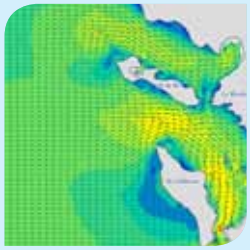
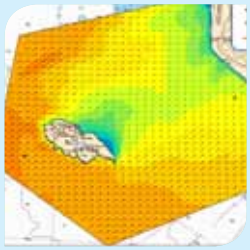
- Assessing agitations (swells, waves, wind waves)
- Assessing circulation and the movement of water masses (currents, tides)
- Ability to measure, model, and forecast physical events

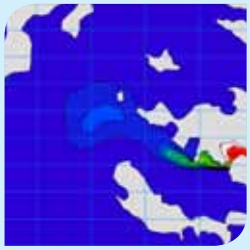
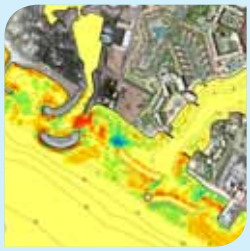
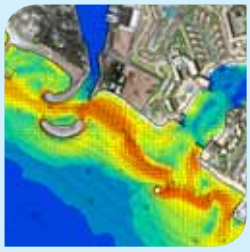
Our tools :

- In situ physical measuring devices (including current meters, buoys)
- 2D and 3D modeling software (currents, perturbations, hydro-sedimentary processes)

Objectives :

- Assessment of currents, waves, tides and weather in support of coastal zone management, and coastal planning and development.
- In situ measurements and mathematical modeling of the physical characteristics of man-made structures and their impacts on the environment.
- Define physical constraints on coastal and offshore structures and infrastructure (dams, wharves, docks, wind farms, platforms, buoys)

MEASUREMENT	EQUIPMENT	DELIVERABLES
CURRENT AND TEMPERATURE MEASUREMENT  RDI workhorse sentinel	**Currentmeters:** • AANDERAA RCM 9 • RDI Workhorse Sentinel current profiler 600 KHz (Bottom tracking)	• Fixed point measurement (bottom moored ADCP) or mobile (floating structure mounted ADCP) • Current velocity and direction time series graphs • Orthogonal velocity graphs • Current velocity and direction histograms • Progressive vector diagrams • Current scatter graphs • Current roses • Residual eulerian currents • Principal component analysis, wind/current relationship • Filtration: current driven by wind or density variation • Spectral and harmonic analysis • Location and evolution of thermoclines
TIDE MEASUREMENT	• Pressure & temperature sensors (NKE)	• Sea level time series graphs • Prediction software • Spectral and harmonic analysis
WAVE MEASUREMENT  RDI workhorse sentinel	• RDI Workhorse Sentinel current profiler 600 Khz with wave option • Pressure and temperature sensors (NKE)	• Significant wave height and period time series graphs • Max wave height time series graphs • Significant wave height and period histo-grams • Probability diagrams • Wave roses, wave spectral and directional energy distribution, wind/wave relationship diagram • Real time measurement
HYDRODYNAMICS (CURRENTOLOGY) 	• 3D Modelling with MIKE3D HD FM (DHI) • TELEMAC 2D (EDF/LNHE) • MARS 3D (IFREMER)	• Modelling of currents (sea, estuaries, rivers) • Taking into account general currents, tide, wind, variations in water density (tempera-ture and salinity) • Hydrodynamic base for other models • Modelling of surges • Modelling of land flooding
SWELL, WAVES 	• MIKE SW (DHI) • MIKE BW (DHI) • SWAN (Delft) • TELEMAC ARTEMIS (EDF/LNHE)	• Swell propagation toward the coast • wind induced wave growth • Sea surface agitation induced by the wind • Extreme wave height assessement for design • Coupling with the hydrodynamic model for hydro-sedimentary modelling • Harbour agitation modelling • Potential wave energy estimation

MEASUREMENT	EQUIPMENT	DELIVERABLES
PLUMES, WATER QUALITY 	• MIKE 3D AD (DHI) • MIKE 3D PT/SA (DHI) • TELEMAC 2D (EDF/LNHE) • MARS 3D (IFREMER) • CORMIX	• Modelling of all types of discharges (water purification plant, industrial, thermal, dredging discharges) • Taking into account the 3D aspect of plumes • Precise modeling of the plume in the near field • Design of diffusers
SEDIMENT DYNAMICS 	• MIKE 3D MT (DHI) • MIKE 3D ST (DHI) • TELEMAC (EDF/LNHE) • MARS 3D (IFREMER) • TRANSPOR (Van Rijn) • Specific developments	• Modeling of transport, erosion and deposition : - of non-cohesive sediments (sand) - of cohesive sediments (fine sediments, mud) • Open-sea or coastal modelling (exemple : beach stability) • Modelling of sediment disposal from dredging
MULTI-THEMATIC 	• Coupling of various models	• Modelling of littoral drift • Modelling of beach erosion due to littoral drift. • Morphodynamic modelling (including bathymetric variation due to deposition and erosion processes)

4.2. Coastal geomorphology, sedimentary processes, and seafloor and sub-bottom mapping

Our competencies :

- Sedimentology, geology and geophysics
- Subsurface geophysics
- Seismic acquisition and interpretation
- Sediment hydro-dynamics
- Seafloor and sub-bottom mapping

Our tools :

- Multibeam echosounder
- Seismic very high resolution
- Side-scan sonar
- Geological and geophysical seabed profiling
- Field expertise
- Hydro-sedimentary processes analysis
- GIS and DTM softwares

Objectives :

- Describe the physical, geological and sedimentary properties of the coastline, seafloor, and sub-bottom
- Describe coastline dynamics
- Analyze hydro-sedimentary processes (sand transit, erosion, accretion)
- Morpho-sedimentary underwater mapping
- Detect objects

MEASUREMENT	EQUIPMENT	DELIVERABLES
SURFACE POSITIONING  DGPS kinematic	• DGPS Furuno GP32 • **RTK positioning** - Thalès Pro FLex 800 - Thalès Z-max • **MBES survey:** - Coda Octopus F185 R+ - positioning • USBL: Easy track lite	• Position chart • Centimetric position • Motion sensor
UNDERWATER POSITIONING  USBL EASY TRACK	• USBL acoustic Positioning - Easy track lite	• dynamic positioning of underwater equipment
BATHYMETRY  R2 Sonic 2022	• Single beam hydrographic echosounder - Navisound 215 • Multi-beams echosounder - R2 Sonic 2022 • altitude unit - inertial unit Coda Octopus F185 R+ • Velocity probe - Valeport Mini SVS - Valeport Mini SVP (vertical profiler) • Recording/Processing: - Hypack/Hysweep 2012	• Position chart • Morpho-bathymetric map, • Vertical diagrams • 3D charts
SEAFLOOR SURVEYING 	• **Side-scan sonar** - KLEIN 3000 side scan sonar - **Recording/Processing:** + Sonar Pro V11.2 + IXSEA Delph 2 sonar software + CARAÏBES 3.6 software	• Underwater wreck or obstacle location • Inspection of pipes or submerged structures • Protection of river banks and structures
SUB-BOTTOM SURVEYING 	• **High Resolution Seismic equipment** - Sparker SIG - Boomer SIG Cent - Boomer IKB-Seistec - Streamer monotrace SIG • **Recording/Processing:** - IXSEA Delph 2 seismic software • **Sub-bottom profiler** - INNOMAR SES 2000 systems	• Sub-bottom vertical • Isopachs of sedimentary deposits • Bedrock mapping
MAGNETOMETRY 	**SEASPY Marine magnetometer**	• Magnetic profile mapping

4.3. Biological, chemical, and physical properties of water and sediments

Our competencies:

- Physical and chemical properties of water and sediments
- Urban, harbour and industrial environmental quality
- Marine microbiology

Our tools:

- Water and sediment sampling, measurements, and analyses
- Partnerships with specialized independent laboratories
- Statistics and numerical modeling

Objectives:

Detect pollution and stress levels using water column and sediment quality indicators

MEASUREMENT	EQUIPMENT	DELIVERABLES
SEDIMENT SAMPLING  KC day grab	**Different types of grabs:** • Smith MC Inthyre • D-Grab • Van Veen grab **Free fall corer (core of 1 or 2 meters)**	• Core analysis • Granulometry • Physicochemical analysis
HYDROBIOLOGY  Niskin sampler  YSI CTD 6920	**Water sampler bottles (Type Niskin)** **Plankton net** **Multi parameters probe YSI 6920 and 6600 with different sensors:** • Temperature • Conductivity • Pressure • Dissolved Oxygen • pH • Redox • Turbidity	• Suspended solids (organic and mineral) • Nutritive salts (concentration and flux) • Chlorophyll, phaeopigment • Temperature, salinity, pH, dissolved oxygen • Phytoplankton and zooplankton • Macrofauna and meiofauna • Macrofloral algae
PHOTOSYNTHETIC PERFORMANCE 	**PAM Fluorometer** (Pulse Amplitude Modulation)	• To monitor the health of corals, seagrass, algae...

4.4. Coastal and marine ecology

Our competencies :

- Marine ecology and biology
- Benthic ecology
- Biological oceanography
- Coral reef ecology
- Experimental fisheries science
- Coastal zone management
- Mapping
- Commercial SCUBA diving
- Partnerships with specialized independent laboratories

Our tools :

- State-of-the-art surveying methods
- Remote sensing tools
- Baseline and long-term monitoring
- Biological indices
- Biostatistics
- Professional underwater photography

Objectives :

Description, zoning, state of health and sensitivity of coastal and offshore ecosystems

MEASUREMENT	EQUIPMENT	DELIVERABLES
BONGO NET 	•Plankton net •Bongo net for ichthyoplankton	• Photos and cartography • Fauna and flora observation and sampling
 ROV LBV 150 SE²	**Professional SCUBA diving equipment** **ROV :** Seabotix LBV 150 SE² USBL positionning system (option)	• Video inspection, inventories
	**Photographic equipement** • Canon G12 • Nikon D80, D200, D300 • Sea and Sea and Ikelite housing • Flash Ikelite and Nikon SB105 • Macro and Wide angle lens	• Corals and benthic assessment • Standard coral monitoring results • Photograph database • Field guides books 
	**Video equipement** • Underwater camera and LED light • Frame for underwater camera • Video camera with display on the boat • Tow wing for video transect • USBL positionning system (option) • Video recorder • Video overlay TXT • Editing software (EDIUS 6)	• Results of In Situ observation methods for benthic monitoring (photo-quadrats, Line Intercept Transects, Video records, etc)  
		

5 - LARGE PROJECT EXAMPLES

CREOCEAN's experience in project management of marine and coastal environments is extensive and worldwide, from routine surveys to large scale development projects.

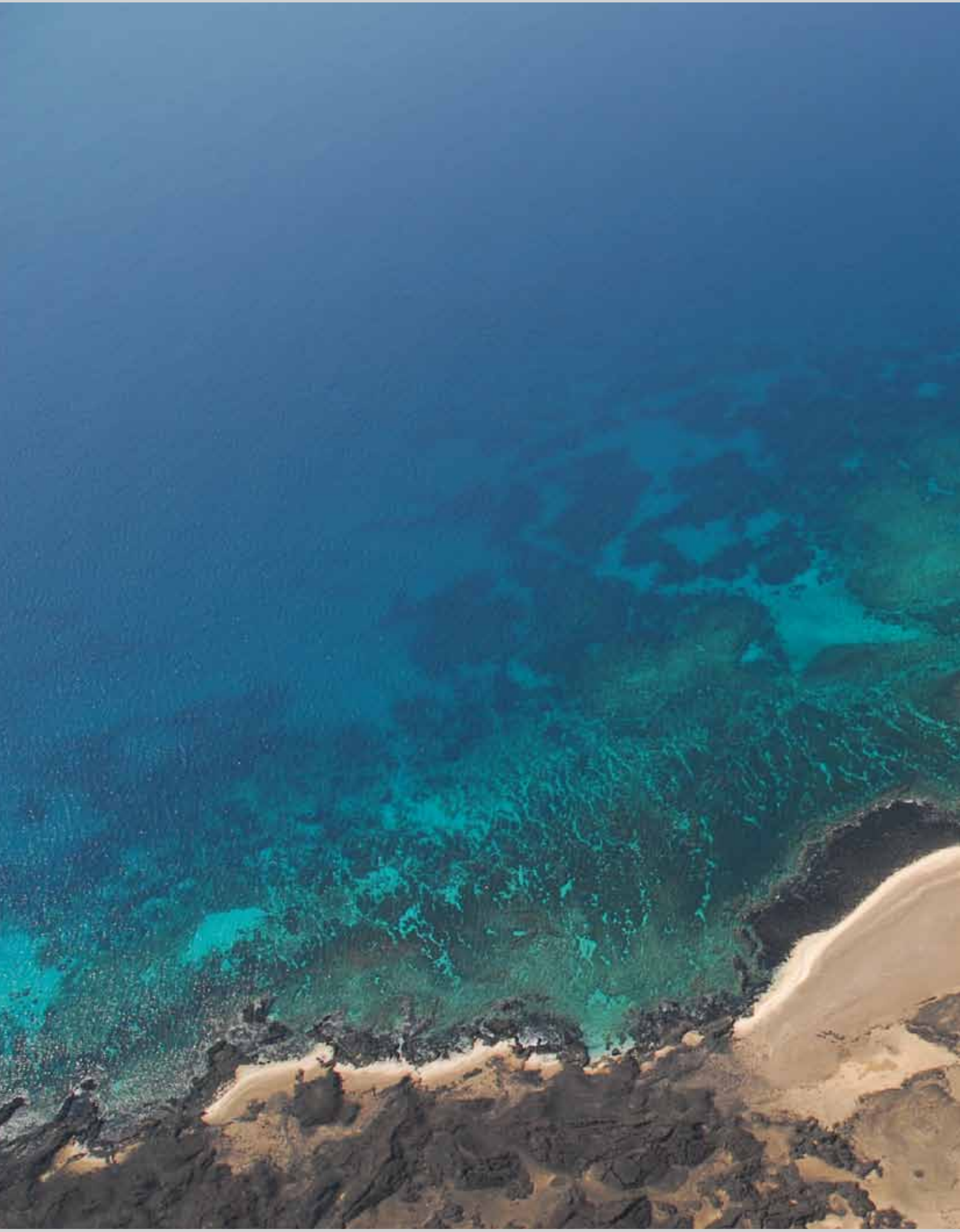
In 2006, CREOCEAN started a collaboration process with the Oil Company Hardman Petroleum (and then Tullow Oil) for environmental studies related to an Oil development project off French Guyana. These studies were related to large Environmental Baseline Studies (EBS) including deep sea sampling and implementation of hydrodynamic models and Oil Spill risk assessments. Environmental Impact Studies (EIA) were also undertaken and related to the exploration of drilling wells as well as to seismic recognition campaigns. In 2011, these studies are still ongoing.

From 2004 up to 2009, CREOCEAN has been conducting long term monitoring projects in Qatar. One of the most important projects, were a series of studies linked to the «Pearl» project, concerning baseline studies and monitoring. Similar studies were also performed for the extension of the New Doha Airport. All these studies were validated by the Ministry of Environment. CREOCEAN also worked directly for this local authority by creating a sensitivity atlas. This atlas is a decision tool for the SCENR giving this institution the possibility to provide advice on the environmental feasibility of new projects.

CREOCEAN is currently developing its activities in the United Arab Emirates. In Abu Dhabi, some studies have been performed for TOTAL ABK, including many projects concerning the impact of certain development projects or Oil & Gas projects. In Dubai, due to the reclamation of certain marine areas, corals were transplanted on artificial reefs and placed in a safe location.

Since 2006, CREOCEAN has been implementing a large monitoring project related to corals in Yemen. Yemen LNG Company has built a large Liquefied Natural Gas Plant (LNG) plant, including a port and off loading facilities. Corals surround the area and the objective were their total preservation. The monitoring included regular coral cartography and health assessment, measurements of turbidity and TSS, control of the efficiencies of mitigation measures, coral transplantations. Real time observations were conducted during the entire project life, therefore enabling a fruitful interaction between the Company and the scientific team.

The following pages summarize some of these studies.



5.1 Marine habitat mapping, atlas and Coastal Zone Management

Area Gulf of Aden **2005**

Country YEMEN

Client YEMEN LNG

Construction of a Liquefied Natural Gas plant. Cartography of coral communities and biodiversity assessment

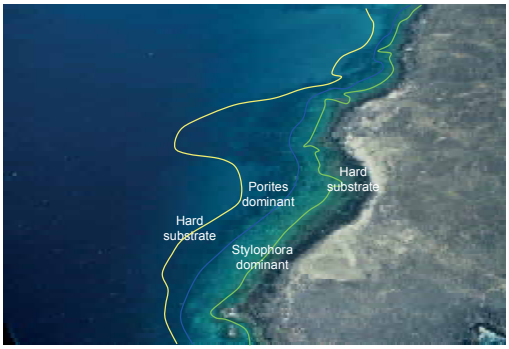
Towards a sustainable management of the sea

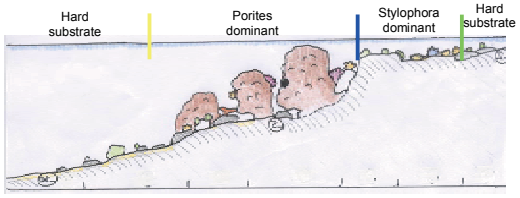
Project description

In 2005, YLNG decided to launch a large construction project of a Liquefied Natural Gas plant. As the plant is situated close to coral areas a detailed assessment of the coral and the fish communities was requested by YLNG to CREOCEAN. This work was done through a field survey including the participation of an international team of experts.

Services supplied

- Organization and coordination of the whole study including the field mission
- During the field mission two teams were working on the same locations: coral team and fish team
- General descriptions of the coral and fish communities were performed all around the Balhaf cape
- Line Intercept Transect method was implemented on seven locations
- A map of the main coral communities was performed thanks to aerial views





Starting date: September 2005
Completion date: October 2005
Value of services: 156 000 Euros

Name of key experts:
Eric DUTRIEUX, Project Manager
Sébastien THORIN, Marine Biologist

Partner:
Francesca BENZONI, Coral specialist, Milano Bicocca University, Italy
Jean-Yves JOUVENEL, Fish specialist, Montpellier, France

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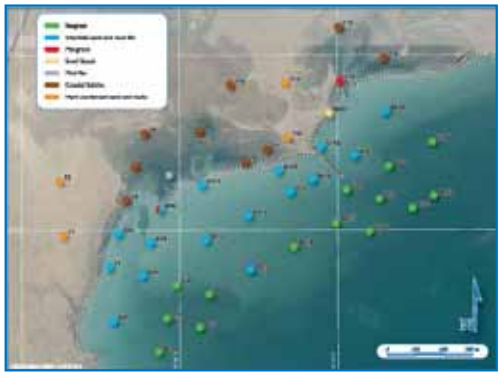
Area Middle-East
Country Qatar
Client WSP/Qatar Foundation

2009

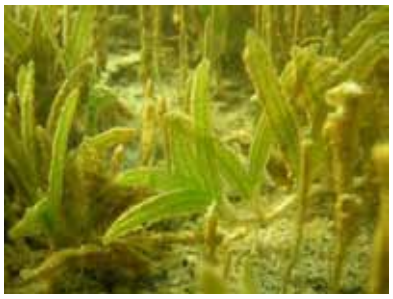
Towards a sustainable management of the sea

Aerospace City Project
Preliminary Coastal Habitat Mapping (Sumaysimah)



Project description

Before the construction and development of the Qatar Aerospace city, a preliminary habitat mapping of the marine and coastal environment was undertaken by CREOCEAN. This study was incorporated into the client's final EIA report for the area.



Services provided

- Preliminary mapping of the main ecosystems using satellite images.
- Site ground truth investigation, in order to validate the preliminary mapping (marine and terrestrial).
- Underwater video transects.
- High quality underwater and aerial photography of the ecosystems present.
- Elaboration of a habitat map.
- Sensitivity evaluation of the coastal and marine habitat and recommendations for the construction project.
- Elaboration of GIS project

Starting date: September 2009
Completion date: November2009
Value of services: 18 000 €uros

Name of key experts:
Dr Eric DUTRIEUX, Project Manager
Edouard HÖRLIN, Marine biologist
Cécile Richard : Coral Specialist

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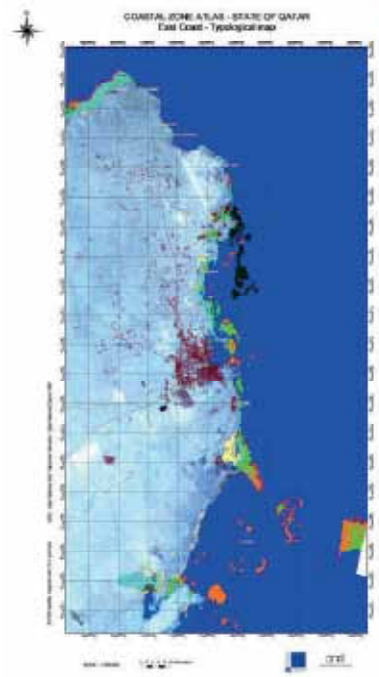
Area : Middle-East **2006-2007**

Country : Qatar

Client : SCENR

Sensitivity Atlas of the Eastern Coast of Qatar

Towards a sustainable management of the sea



Project description

The sensitivity atlas of the Eastern coast of Qatar is a management tool for the Supreme Council for Environment and Natural Reserves (SCENR).

Services provided

- Preliminary mapping of the main ecosystems using satellite images.
- Site ground-truth mission in order to validate the preliminary mapping (marine, terrestrial and aerial investigations).
- Coral health, sea grass and beach quality assessment
- Typology and sensitivity maps.
- Guidelines for an environmental coastal plan.

Starting date: 05/2006
Completion date: 03/2007
Value of services: 214 000 USD

Name of key experts:
Dr Eric DUTRIEUX, Marine Ecologist
Francesca BENZONI, Coral Expert
Asghar MOBARAKI, Turtle Expert
Romain LE GALL, Marine Environment Engineer

Partners:
Universal Trade Line, local Marine Company
TTI Production, GIS company

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Area Middle-East
Country Qatar
Client UNESCO

2005

Development of a Nomination File "Nomination of the Khawr al Udayd area for the inclusion on the Natural World Heritage List"

Towards a sustainable management of the sea

Project description

The purpose of the activity is to assist the State of Qatar in identifying and protecting natural heritage properties of outstanding universal value. The goal of the proposed activity is to develop a nomination file for an area of outstanding natural regional and international value, Khawr al Udayd, also known as the Inland Sea.

Services provided

- Overall coordination of the project (including terrestrial biodiversity, marine environment and tourism)
- Marine environment team leadership
- Writing and production of the Nomination File.

For the marine part, observations were made through different techniques:

- Punctual dives on predefined locations;
- Submarine transects for large bottom surfaces;
- Surface transects for shallow waters.

Starting date: March 2005
Completion date: June 2005
Value of services: 20 000 €uros

Name of key experts:
Eric DUTRIEUX, Overall project manager
Stephane SARTORETTO, Marine Biologist

Partners:
Qatar Tourism Authority
Supreme Council for Environment and Natural Reserves

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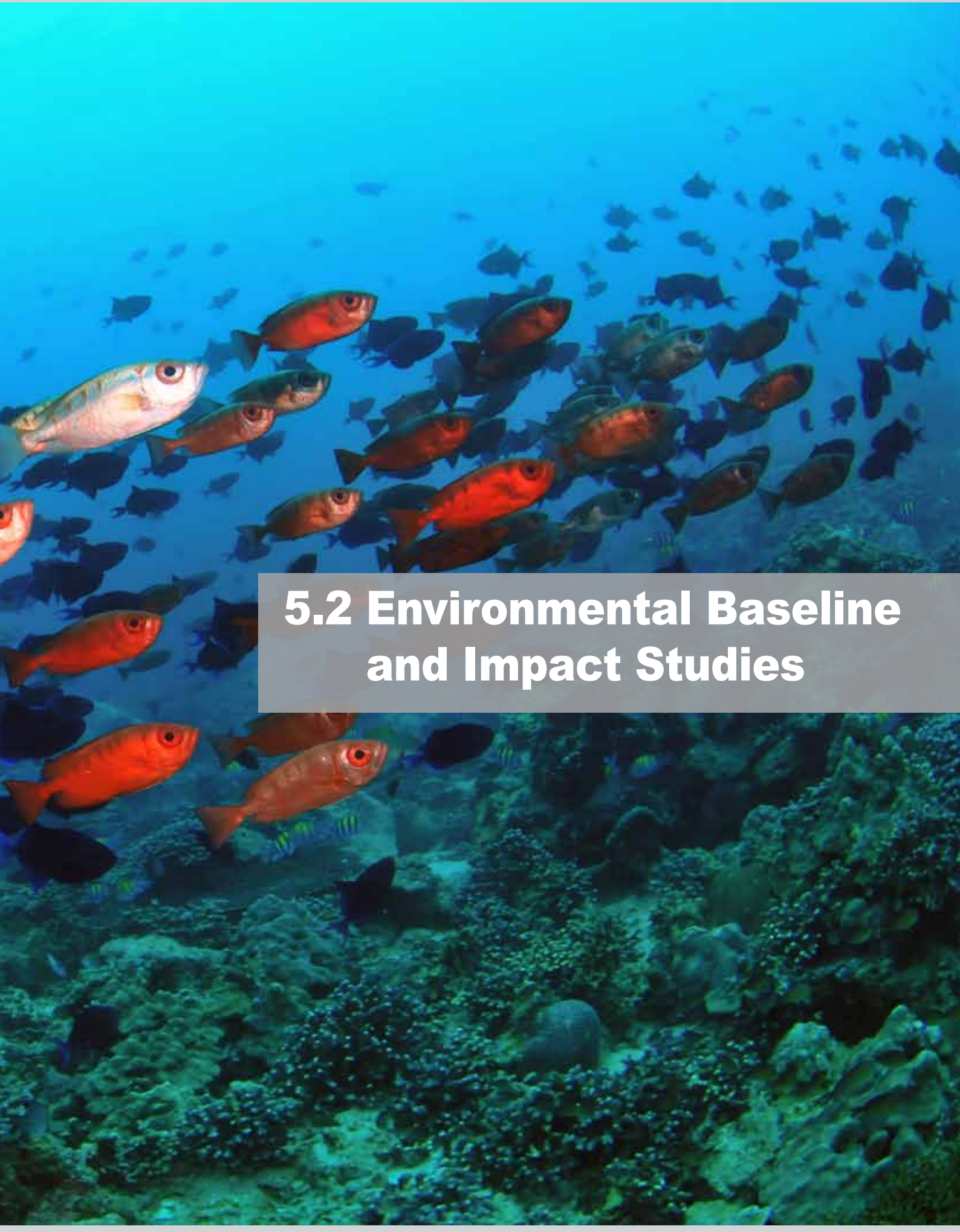


5.2 Environmental Baseline and Impact Studies

Area South America
Country French Guiana
Client HARDMAN PETROLEUM FRANCE

2006

Towards a sustainable management of the sea

Environmental Impact Assessment Study for an offshore exploration drilling well offshore French Guiana

Project description

Oil Companies Hardman Petroleum France has an exclusive oil prospecting licence off French French Guiana.

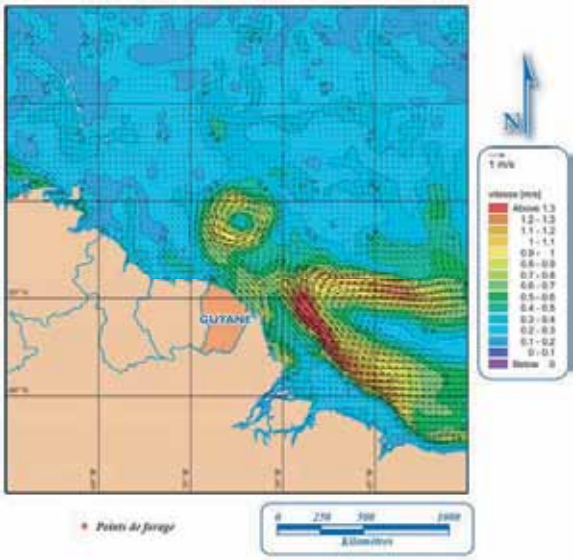
In order to evaluate the hydrocarbon production potential beyond the continental plateau, these companies decided to drill an exploration well on 2 sites 300 km away from each other.

For this purpose, the company must apply for 2 work opening authorizations for which an Environmental Impact Assessment is compulsory in order to be sure that this project is compatible with each site's natural and human environment.

CREOCEAN had to carry out these 2 Environmental Impact Assessments.

Services supplied

- Biological and sedimentary campaign on each site
- Environmental Baseline Study involving water, sediment, benthos and fish assessment
- Turtle satellite tracking with Argos markers
- Creation of a 3-D stream modeling and simulation of an oil slick displacement
- Impacts analysis
- Proposal of mitigation measures



Starting date: March 2006
Completion date: November 2006
Value of services: 701 698 €

Name of key experts:
Dr Eric DUTRIEUX, coordinator
Xavier DOLBEAU, scientist in environmental management

Towards a sustainable management of the sea

Area Middle-East
Country QATAR and BARHAIN
Client COWI

2008-2009

Qatar-Bahrain Causeway Project
Underwater video survey

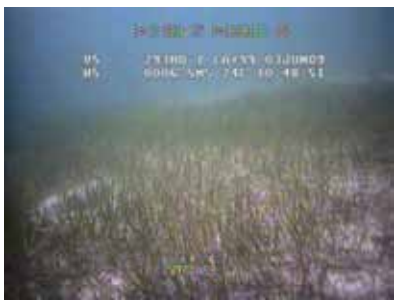
Project description

The Qatar Bahrain causeway will be a 40km long fixed link between the two countries made by a combination of embankments and bridges. As part of the Environmental Baseline Survey an extensive underwater video survey was requested along the causeway alignment, shipping channels and borrow areas. The objectives of the study were:

- to videotaped 164 predetermined transect lines representing a total of 82km using different techniques depending on depth and seabed coverage.
- to describe the seafloor biological coverage and evaluate the sensitivity on the basis of the video.
- to provide georeferenced video footage

Services provided

- ❖ Deployment of a ROV mounted on a sledge
- ❖ Deployment of divers equipped with underwater video camcorder
- ❖ Production of georeferenced maps presenting the seabed biological coverage and sensitivity.



Starting date: 2008
Completion date: 2009
Value of services: 276,000 USD

Name of key experts:

Dr E. DUTRIEUX, Corrdinator
R. Le GALL, Marine biologist
C. RICHARD, Marine biologist
E. HORLIN, Marine biologist

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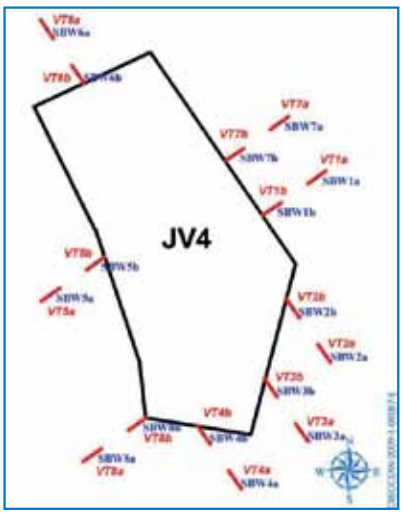
Towards a sustainable management of the sea

Area Middle-East
Country QATAR
Client JV Jan de Nul dredging Ltd/ Boskalis Westminster

2007-2009

Ras Laffan Port Expansion Project Marine Environmental Study at JV4 Borrow Area



Project description

The extension of Ras Laffan port consisted on a combination of breakwaters and platforms reclaimed on the sea. Dredging operations generated a large quantity of excess material which was disposed of into JV4 borrow area. Therefore, two identical marine environmental campaigns were performed before and after refilling activities. The objectives of the monitoring were :

- to describe the environmental state of the surrounding area of JV4 borrow area before and after refilling activities
- to describe the evolution of environmental parameters
- to assess the possible impacts of the works on the surrounding environment
- to propose rehabilitation or compensation measures in case of harmful effects directly imputable to the project

Services provided

- Water physico-chemical quality
- Sediment physico-chemical and biological quality
- Sea-bottom video recording along pre determined transect lines to assess the biological coverage.

Starting date: 2007
Completion date: 2009
Value of services: 147,000 EUR

Name of key experts:

Dr E. DUTRIEUX, Corrdinator
R. Le GALL, Marine biologist
JD BERGERON, Marine biologist
E. HORLIN, Marine biologist

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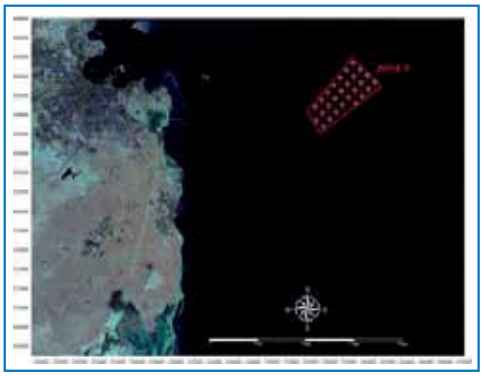
Area Middle-East
Country Qatar
Client GEMS / JV NDIA

2005-2006

Towards a sustainable management of the sea

New Doha International Airport. Environmental Impact assessment of new offshore borrow areas

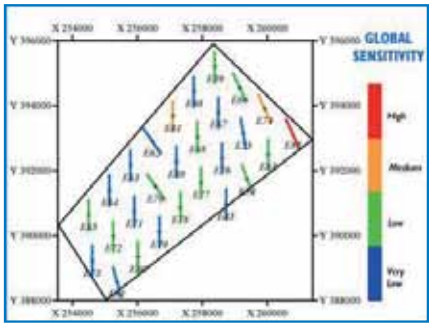


Project description

The new Doha International Airport is being built on a platform reclaimed from the sea. The platform is built using sand dredged from an offshore borrow area. A marine survey has been undertaken in order to assess the potential impacts of the project on various offshore borrow areas (6 different areas). The results of these surveys were presented to the local government authority (Supreme Council for Environment and Natural Reserves) in order to obtain the permit to dredge.

Services provided

- Collection of data about the water column
- Sediment physico-chemical quality assessment
- Study of the fauna living inside the soft (sandy) sediment (macrofauna)
- Visual observations of the sea floor (ROV transects) whose objective was to detect high ecological value species such as corals, sea-grasses, etc.



Starting date: March 2005
Completion date: July 2006
Value of services: 277 000 €uros

Name of key experts:
Dr Eric DUTRIEUX, Coordinator
Dr. Sébastien THORIN, Marine biologist
Jean-Damien Bergeron, Marine biologist

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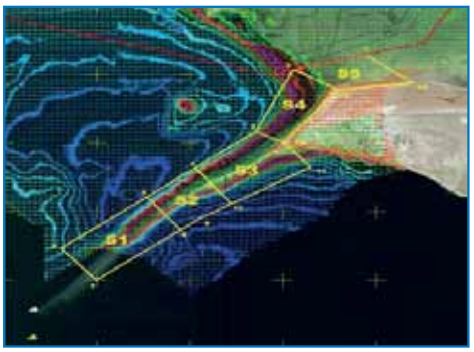
Area Middle-East
Country Qatar
Client QATAR DREDGING COMPANY

2004-2006

Environmental Baseline Studies of proposed sediment borrow areas for the Pearl of the Gulf Project

Towards a sustainable management of the sea



Project description

"The Pearl" 4-km² luxury touristic island is being built in the Bay of Doha. 12 million m3 of refilling material are taken from sea beds in the surrounding area. Borrow areas need to be investigated for dredging authorizations by the Supreme Council for Environment and Natural Reserves (SCENR).

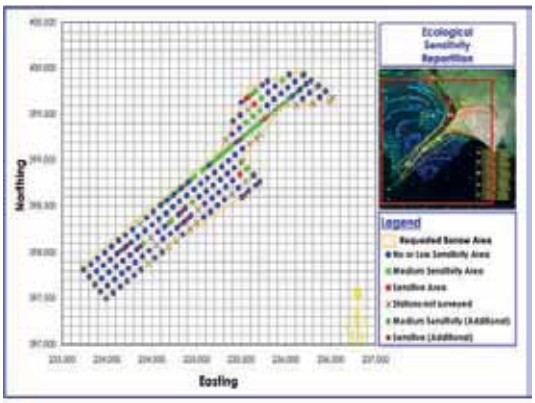
Services provided

- Description of the marine environment done on the basis of ecological sensitivity mapping
- Field survey including submarine and video observations
- Semi-quantitative notation grid used to establish the ecological sensitivity of selected stations, on the basis of presence, density and diversity of valuable species and ecosystems.
- Results correlated with hydrodynamic and geomorphologic observations. Possible dredgeable areas were suggested in order not to harm the Northern high value ecosystems.

Starting date: October 2004
Completion date: September 2006
Value of services: 109 000 €uros

Name of key experts:
Dr Eric DUTRIEUX, Marine ecologist
Dr. Sébastien THORIN, Marine biologist
Jean-Damien Bergeron, Marine biologist

Partners:
Universal Trade Line, local Marine Company



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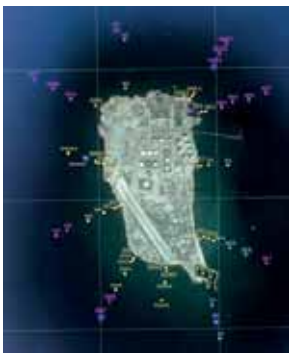
Towards a sustainable management of the sea

Area Middle-East **2009**

Country ABU DHABI

Client ADMA-OPCO ADGAS

Environmental Baseline Study of Das Island marine area



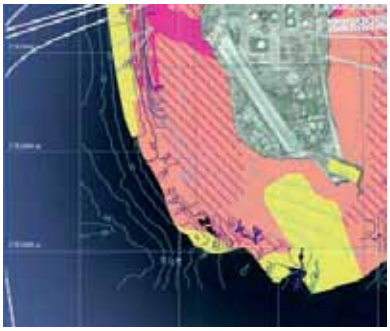
Project description

The objective of the project was to determine the current status of the marine environment and to compare this status with international benchmarks and previous survey data. Habitat maps were produced and critical areas for contamination identified (if any). Finally an environmental monitoring plan was proposed.

Services supplied

- To organize a multidisciplinary marine survey around Das Island
- To carry side scan sonar and bathymetric measurements
- To carry water and sediment sampling
- To make observations through a drop down camera and through diving
- To produce a comprehensive report including data treatment and interpretation

Starting date: March 2008
Completion date: October 2009
Value of services: 380 000 US $



Name of key experts:

Eric DUTRIEUX, Project Manager
Jean-Damien BERGERON, Biologist; Field study coordinator
Patrice WALKER, Geophysics specialist
Romain LE GALL, Biologist

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Area Middle-East
Country Abu Dhabi
Client TOTAL ABK

2003

Towards a sustainable management of the sea

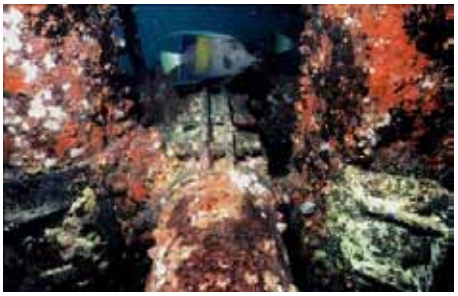
Impact Assessment of Domestic Effluents Discharge on ABK Field

Project description

The Central Complex of the ABK field produces domestic effluents due to the activity of the living quarters. TOTAL ABK requested that CREOCEAN characterize the ecological effects of the effluents on the site in order to know if it was necessary or not to implement an installation for sewage treatment, taking into account the cost of such an installation.

Services provided

- A bibliographical review of previous studies done on the subject.
- To prepare and carry out a survey and consequent analysis.
- To assess the impact of the ABK field domestic effluents on the marine environment.
- To prepare a monitoring program.



Starting date: July 2003
Completion date: September 2003
Value of services: 78 000 €uros

Name of key experts:
Dr Eric DUTRIEUX, Coordinator
Jérôme DAVIGNON, Specialized technician

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Towards a sustainable management of the sea

Area Middle-East
Country Jordan / Egypt
Client URS - WCI

2001

Reference 101012

Marine Environmental Baseline Study of the Gulf of Aqaba

Project description

The objective of the study was to describe the natural characteristics of the marine location of the project including the shore and seabed up to a depth of 40m on the Jordanian and Egyptian coasts.
Several sites on each coast have been selected for the pipeline shoreline cross-over.

Services supplied

Underwater observations were made by snorkelling and scuba-diving to gather information on the type of sea bottoms and their richness in living coral and relics, and in other benthic organisms.

To characterize each surveyed location, the different type of submarine ecosystems was classified. For each category (coral reef, scattered corals, sea-grass meadow …) a sensitive level was associated depending on the richness and the diversity of the living biota. Coral health is determined according to the percentage of living coral along a given length of a transect line.

Tentative map of the submarine occupation were draw. Categories have been associated to a sensitivity evaluation. Only the zones characterized by a low sensitivity could be suitable for the pipeline shore approach.

Starting date: 2001
Completion date: 2001
Value of services: 105 000 €uros

Name of key experts:
Dr Olivier LE BRUN, Hydrobiologist and chemist
Dr Eric DUTRIEUX, marine biologist and supervisor
Dr Sébastien THORIN, marine biologist

Location:
Gulf of Aqaba (Jordan and Egypt)

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5.3 Monitoring

Area South America
Country French Guiana
Client HARDMAN

2005

Towards a sustainable management of the sea

Coordination of sea turtles and cetaceans protection during a seismic recognition campaign off French Guiana

Project description

In 2005, Hardman wishes to carry out a seismic recognition campaign off French Guiana. For this purpose, the company must apply for a work opening authorization.
This campaign involves a monitoring by scientists in real time in order to reduce the impacts on sea turtles and cetaceans. The aim is to be sure, at each seismic shooting, that none of these protected species is present nearby.
CREOCEAN had to gather together a team of scientists, biologists and acousticians and to coordinate their action.

Services supplied

- Selection of scientists, biologists and acousticians
- Involvement in the procedure to follow before each seismic shooting
- Getting the approval of the procedure from the authorities
- Coordination of the team
- Reports

Starting date: November 2005
Completion date: December 2005
Value of services: 105 000 €
Name of key experts:
Dr Eric DUTRIEUX, coordinator
Laurent PONGE, Biologist

Partners:
Pr Marc GIRONDOT, Orsay University, France
Xavier DEMOULIN, MAREE Company, France,

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Area Gulf of Aden **2007**

Country YEMEN

Client YEMEN LNG

Towards a sustainable management of the sea

Effects of the construction of a Liquefied Natural Gas plant. Turbidity and Total Suspended Solids monitoring.

Project description

The construction of marine facilities linked to an LNG plant had the potential to put in suspension fine particles which generates turbid plume and suspended solids in the water column. YLNG protect the sensitive areas with silt curtains, but requested that CREOCEAN monitor the efficiency of this device by measuring the turbidity and the Total Suspended Solids (TSS).

Services supplied

- Proposal of an adapted sampling program
- Sampling and direct measurements for TSS and Turbidity on a daily basis using specific devices (YSI CTD probe, Niskin bottles)
- Laboratory analysis for TSS
- Interpretation of data and comparison to threshold levels

Starting date: January 2007
Completion date: November 2007
Value of services: 142 000 Euros

	TSS (mg/l)	Turbidity (NTU)
Environmental Threshold	**10**	**29**
Background (normal conditions)	3	1
Background (during strong wind)	8	-
Background (during monsoon)	15	10

Name of key experts:
Eric DUTRIEUX, Project Manager
Jean-Damien BERGERON, Marine Biologist
Jerome DAVIGNON, Specialized Technician

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Area Gulf of Aden **2007**

Country YEMEN

Client YEMEN LNG

Effects of the construction of a Liquefied Natural Gas plant. Characterization of the sediment origin.

Towards a sustainable management of the sea

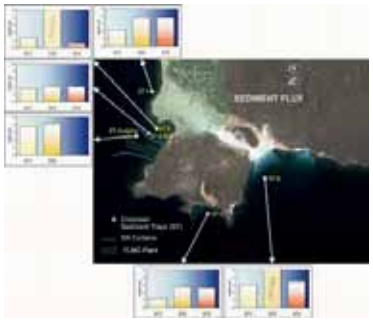
Project description

The construction work of a LNG plant could generate some additional sediment inputs into the marine environment, thus potentially damaging corals. In order to minimize the impacts, YLNG requested that CREOCEAN identify within the sediments the part which is natural and the part which is due to the construction work.

Services supplied

- Quantitative and qualitative description of the sediment observed on the sea bottom and on the corals
- Evaluation of fluxes and characteristics of the marine sedimentation under natural conditions using sediment traps
- Evaluation of increased sedimentation or modified sediment texture/composition deriving from the construction activities in the area (bulk sediment)

Starting date: January 2007
Completion date: June 2007
Value of services: 59 000 Euros



Name of key experts:
Eric DUTRIEUX, Project Manager
Jerome DAVIGNON, Specialized Technician

Main researcher:
Daniela BASSO, Milano Bicocca University, Italia
Francesca BENZONI, Milano Bicocca University, Italia

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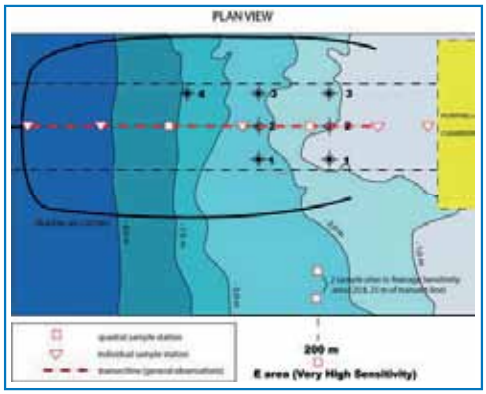
Towards a sustainable management of the sea

Area Gulf of Aden **2007**
Country YEMEN
Client YEMEN LNG

Effects of the construction of a Liquefied Natural Gas plant. Potential impact of blasting on the marine fauna.

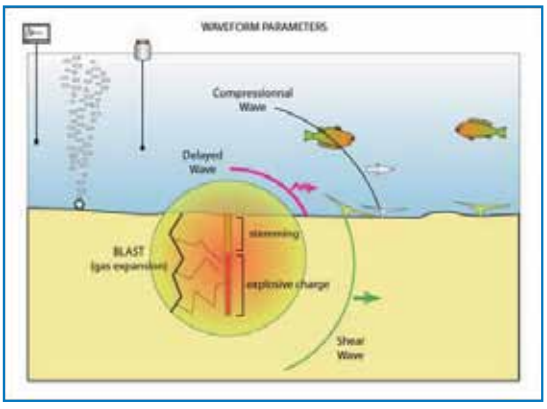


Project description

One option considered to achieve marine construction work of the LNG plant was to implement controlled trial blasting operations in the marine areas. In order to check if the impacts would be acceptable, the trial campaign was performed and CREOCEAN was asked to check the intensity of the potential environmental effects on fish and corals. As an outcome, a less intrusive technique was selected for the works.

Services supplied

- Noise measurements inside and outside a bubble curtain barrier
- Fish observations by direct underwater assessment (lethal and sub-lethal effects)
- Direct coral observations by scientific scubadivers



Starting date: October 2006
Completion date: March 2007
Value of services: 116 000 Euros

Name of key experts:
Olivier LEBRUN, Project Manager
Jean-Damien BERGERON, Marine Biologist

Partner:
Xavier DEMOULIN, MAREE Company, France
Jean-Yves JOUVENEL, P2A Company, France

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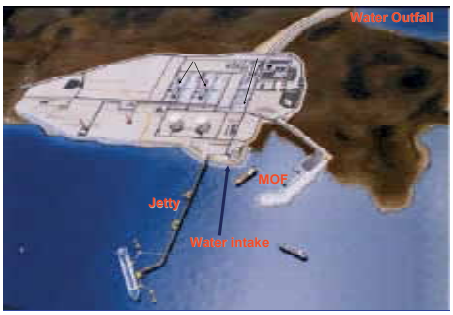
Area Gulf of Aden
Country YEMEN
Client YEMEN LNG

2006-2009

Towards a sustainable management of the sea

Effects of the construction of a Liquefied Natural Gas plant. Coral monitoring.

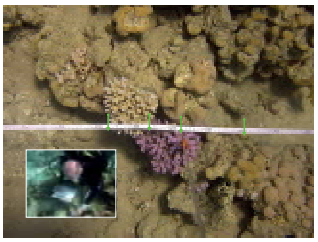


Project description

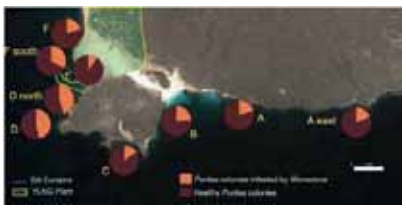
The marine phase of the construction of a LNG plant had the potential to generate some sediment release on the surrounding corals as well as physical disturbance. YLNG has implemented a monitoring system able to detect negative effects of the construction on the corals at an early stage. Impact of the construction work can therefore be minimized.

Services supplied

- To monitor the impacts of construction on coral health, CREOCEAN established a coral monitoring program
- Monitoring started in February 2006 and will continue to the end of 2008
- Line Intercept Transect method was implemented on nine locations with four transects per locations
- Belt transects and permanent photo-quadrat methods were also implemented
- Results are provided by CREOCEAN to YLNG on a real time basis and, if necessary, decisions to modify the work statement or even the project are taken immediately



Starting date: February 2006
Completion date: November 2009
Value of services: 1000 000 Euros



Name of key experts:
Eric DUTRIEUX, Project Manager
Sébastien THORIN, Marine Biologist

Partner:
Michel PICHON, Coral Specialist, Perpignan University, France
Francesca BENZONI, Coral specialist, Milano Bicocca University, Italy

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Area Middle-East
Country Qatar
Client TOTAL E&P QATAR

Reference 1070012

2007-2008

Towards a sustainable management of the sea

Environmental Monitoring Survey at Al Khalij Field – Block 6

Project description

TOTAL E&P QATAR is operating Al Khalij oil field (block 6) in the territorial waters of the state of Qatar. Situated at 110 km East from Qatar mainland, this field comprises both offshore and onshore components (Halul Island). The facilities are composed of several platforms which are linked by two pipe-lines to the Oil/Water/Gas separation trains situated on Halul Island.

Following the EIA recommendations of 2002 a new environmental monitoring was declared necessary. Therefore in October 2007 CREOCEAN undertook an environmental survey around the marine areas surrounding the platforms and to a smaller extent around the terrestrial facilities.

Services provided

- Seawater physico-chemical data collection for quality analysis.
- Sediment physico-chemical quality sampling.
- Soft sediment biological quality by benthic fauna laboratory analysis.
- Terrestrial soil sediment quality sampling.
- Data analysis and interpretation followed by report writing.

Starting date: July 2007
Completion date: June 2008
Value of services: 133,000 USD

Name of key experts:
E. DUTRIEUX, Coordinator
R. LE GALL, Marine Ecologist
J.D. BERGERON, Marine Ecologist
J. DAVIGNON, Specialized Technician

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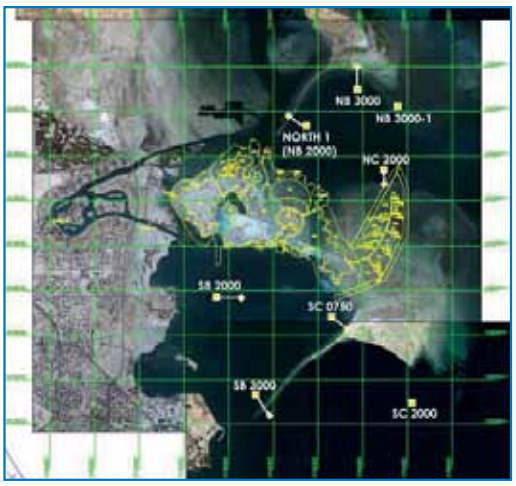
Towards a sustainable management of the sea

Area Middle-East
Country Qatar
Client UDC / QDC

2004-2007

Pearl of the Gulf Island Project. Tactical monitoring and site rehabilitation



Project description

A monitoring program was included in the environmental part of "The Pearl" development project, which aims were to evaluate the impacts of dredging and refilling works on the surrounding environment of the future island. The objectives of the monitoring were :

- to describe the environmental state of the surrounding area of the project site after dredging work
- to describe the evolution of environmental parameters
- to assess the possible impacts of the works on the surrounding environment
- to propose rehabilitation or compensation measures in case of harmful effects directly imputable to the project

Services provided

- ❖ Water physico-chemical quality
- ❖ Sediment physico-chemical and biological quality
- ❖ Sea-bottom occupation by sensitive benthic communities such as coral reefs or sea grass beds, or by sensitive species including sponges, large shells (Pinna sp., Oyster...), etc.

Starting date: 2004
Completion date: May 2007
Value of services: 127 000 Euros

Name of key experts:
Dr Eric DUTRIEUX, Corrdinator
Dr Sébastien THORIN, Marine biologist
Romain Le GALL, Marine biologist

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SEAQUEST
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5.4 Relocation and restoration of corals

Towards a sustainable management of the sea

Area : GULF OF ADEN **2009**

Country : YEMEN

Client : TOTAL

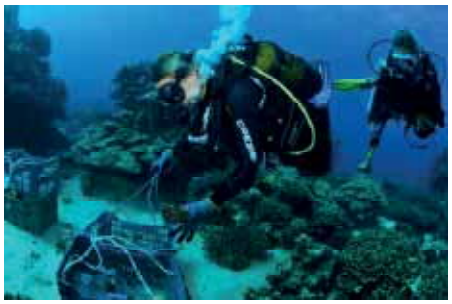
Coral reefs restoration after construction work

Project description

During the 4 years of the construction phase of an LNG plant, some work generated limited impacts on corals. In order to rehabilitate the damaged areas, a restoration operation was undertook. It consisted in an experimental study prior to a large scale operation and to the restoration process itself.

Services supplied

- To conduct an experimental study on the collection and pasting of corals on different substrates
- To describe according to the experimental results a methodology for a large scale operation
- To conduct the large scale operation by cutting small pieces of corals from coral dense areas and pasting these corals on areas to be restored
- To produce baseline observations of the restored area in order to put in place a monitoring



Starting date: March 2009
Completion date: December 2009
Value of services: 300 000 Euros

Name of key experts:

Olivier LEBRUN, Project Manager, Creocean, France
Fany SEGUIN, Coral Specialist, Creocean, France
Cécile RICHARD, Coral specialist, Creocean, France

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Area Gulf of Aden **2007**

Country YEMEN

Client YEMEN LNG

Towards a sustainable management of the sea

Mitigation measures of the construction of a Liquefied Natural Gas plant. Coral translocations.

Project description

Yemen LNG recognized that some minor physical damage to coral may occur during the construction work of an LNG plant. Potentially impacted coral colonies in these work areas are translocated by CREOCEAN to areas inside and around the project perimeter for the purpose of saving corals and maintaining the overall area of coral cover and biodiversity.

Services supplied

- Examination of a number of options related to sites characteristics, type of colonies to be translocated and implementation of new translocation methods
- Development of specific transport methods for large colonies
- More than 1500 colonies translocated including colonies weighing 4 tons, for the first time in the world
- Baseline and monitoring of the transplanted areas with a success rate of over 90% of colonies survival

Starting date: January 2007
Completion date: November 2007
Value of services: 742 000 Euros

Name of key experts:
Olivier LEBRUN, Project Manager
Fany SEGUIN, Coral translocation specialist

Partner:
ETPS, Commercial divers Company, France

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Towards a sustainable management of the sea

Area : PACIFIC OCEAN
Country : TETIAROA (French Polynesia)
Client : TBSA (Pacific Beachcomber SA)

2009
2010

Coral reef relocation before channel digging

Project description

Construction of a luxury eco-resort on Tetiaroa atoll in French Polynesia involves digging a lagoon channel and a trench for a pipe installation. In order to limit the impact of construction and to keep close to the environmental sustainable image of the project, a relocation of the beautiful micro-atoll corals that characterize the place was undertaken.

Services supplied

- Inventory and marking of the coral selected for translocation in the area
- To conduct the operation by moving large colonies out of the impact area
- To monitor the recovery of the transplanted corals
- More than 300 large *Porites* relocated (± 1m in diameter) and 300 small colonies (*Porites*, branching *Acropora …)*
- Success of the operation especially for the large corals (no loss)

Starting date: July 2009 (channel) – December 2010 (trench)
Completion date: November 2009 (channel) – 2011 (trench)
Value of services: 30 000 Euros

Name of key experts:

Fany SEGUIN, Coral Specialist, France (Tahiti)

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5.5 Artificial reefs

Area : Mediterranean sea

Country : France

Client : Languedoc-Roussillon Regional Council

2010-2011

Towards a sustainable management of the sea

Elaboration of guidelines for the monitoring of artificial reefs in the Languedoc-Roussillon region

Project description

The study consisted in the elaboration of a standardized scientific monitoring methodology applied to artificial reefs projects.
Indeed, due to the variety of reef types in the region, it is necessary to harmonize methodologies to allow a comparison of the results between the various sites of immersion and obtain a global vision of the efficiency of these immersions. The implementation of relevant, reliable monitoring indicators is therefore essential.
The study aims at defining these indicators, and describing their function and their interest. This selection is made according to the concerned biological compartments (fish production, environment protection, compensation measures, leisure,…) while favoring a "cost/efficiency" approach for every indicator.

Services supplied

- Bibliographical analysis of monitorings realized in Languedoc-Roussillon and on the Atlantic coast.
- A critical analysis of the past monitorings with a synthesis of all the different methods used.
- Elaboration of a clear and concrete tool allowing the technicians from the city councils to write Terms of Reference for scientific monitorings.
- Implementation of a standard protocol for artificial reef monitoring for future studies in Languedoc-Roussillon.
- Publication of a guidelines booklet.

Starting date: July 2010
Completion date: February 2011
Value of services: 30000 €uros

Name of key experts:
Sébastien THORIN, Project Manager
Thibault SCHVARTZ, Marine biologist

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Area : Middle-East
Country : Dubai
Client : EMEG/ NAKHEEL

2007

Towards a sustainable management of the sea

Development of artificial reefs and coral transplantations

Project description

Dubai water front is constructing a new development project South of Palm Jebel Ali. Coral reefs occur within a small band parallel to the coast between 500 m and 1000 m offshore, where the project lies. In order to preserve these corals, it is thus necessary to move most of the coral colonies to a safe place. NAKHEEL invited EMEG and CREOCEAN to perform such translocations.

Services provided

- Research for a new site where to place back the corals.
- Checking the location where to take the corals.
- Defining a final location for the coral collection and collection strategy for the next phase of work.
- Developing an area with large blocks (artificial reefs).
- Starting the collection work and the colony pasting.

Starting date: October 2007
Completion date: December 2007
Value of services: 90 000 €uros

Name of key experts:
Dr Eric DUTRIEUX, Coordinator
Fany SEGUIN, Coral specialist

CREOCEAN – Consultancy in Coastal and Marine Environment and in Oceanography
www.creocean.fr / Info at creocean@creocean.fr

Area: Mediterranean sea

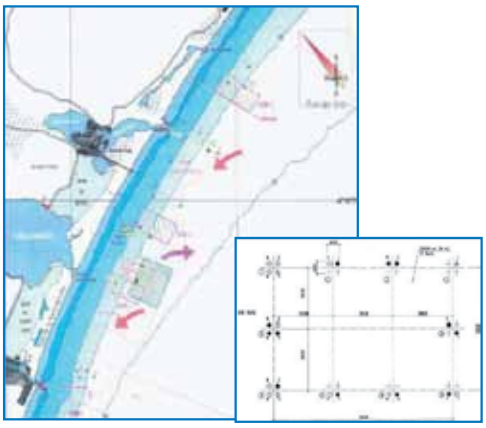
Country : France

Client : Gruissan Municipality

1999-2007

Scientific monitoring for artificial reefs immersions off Gruissan (Languedoc-Roussillon)

Towards a sustainable management of the sea



Project description

In 1999, 2002 and 2005, the Gruissan municipality decided to immerse artificial reefs along its coast in depths between 12 and 23 meters.

These reefs were intended to favor the protection of sea bed and fish reproduction. They may also allow to manage the conflicts between fishermen (e.g. anti-trawling reefs). The objectives of this monitoring was therefore to evaluate the efficiency of these reefs and especially their ecological vocation (protection of species or endangered habitats, biological valuation, rehabilitation and restoration of damaged sites).

Services supplied

- Measurement of the physical characteristics of the reefs
- Regular measures of the physical behavior of the reefs to estimate their "durability" and efficiency in avoiding trawling
- Studies on the colonization of the reefs by invertebrates, as well as fixed and mobile fauna
- Fish monitoring by *in-situ* counts
- Experimental fishing and survey with fishermen

Starting date: April 1999
Completion date: April 2007
Value of services: 114 470 €uros

Name of key experts:
Eric DUTRIEUX, Project Manager
Sébastien THORIN, Marine Biologist

CREOCEAN – Consultancy in Coastal and Marine Environment and in Oceanography
www.creocean.fr / Info at creocean@creocean.fr

Towards a sustainable management of the sea

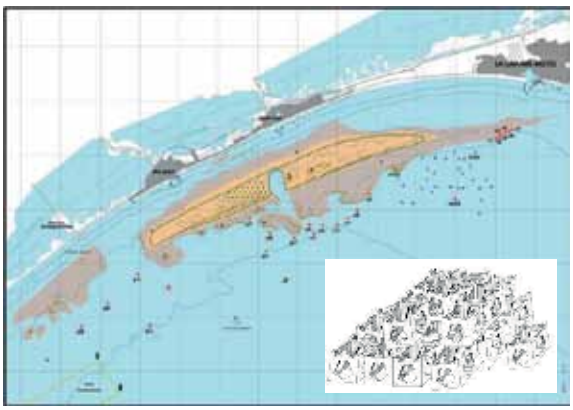
Area: Mediterranean sea

Country : France

2001-2004

Client : PROFESSIONNAL ASSOCIATION FOR FISHING DEVELOPMENT

3-year monitoring of artificial reefs on the marine environment and on the commercial fishing activities in Aigues-Mortes Gulf



Project description

During the last decades, artificial reef immersions along the European and world coasts have stared to increase. The scientific studies dedicated to the efficiency of these reefs brought to light a big variety of actions and phenomena connected to their presence. The objective of this monitoring program was to bring information on the efficiency of these reefs and to understand their ecological processes. The understanding of these phenomenon's will allow to propose improvements and evolutions, useful for the development of further programs of immersion.

Services supplied

- Fish counting's *in situ* to check the efficiency of the attractiveness effect of the reefs on the fauna of commercial interest
- Assessment of the invertebrate fauna, to verify the adequacy of the reef substratum with the fixation of invertebrates larva
- Study of the fauna on the soft bottom around the reefs to evaluate the effect of the organic matter production increase on the populations situated near the reefs.
- Fishing implementation on the reef

Starting date: July 2001
Completion date: December 2004
Value of services: 126 400 €uros
Name of key experts:
Eric DUTRIEUX, Project Manager
Sébastien THORIN, Marine Biologist

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5.6 Research & Development projects

Area : French Guyana

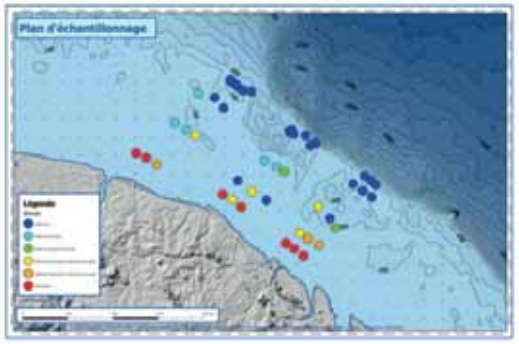
Country : France

Client : ENVIRONMENT MINISTRY

2009-2011

Towards a sustainable management of the sea

Soft bottom marine fauna biodiversity study



Project description

The French environment ministry has recently confirmed his position to improve the knowledge of the marine environment in French Guyana.

This Research and Development project aim to strengthen the assessment of the biodiversity by focusing on the benthic species. The 2009 campaign targeted the sampling of macrofauna.

The objective is to assess the biodiversity of the soft bottom macrofauna of this undiscribed area.

Services supplied

- Macrofauna sampling to complete knowledge of the benthic species on this undiscribed area
- Measures on sediments and water bodies of the French Guyanese continental shelf
- Determinate benthic communities with focus on description of the new species
- Scientific paper writing

Starting date: September 2009
Completion date: May 2011
Value of services: 285 275 €
Name of key experts:
Eric DUTRIEUX, Project Manager
Thibault SCHVARTZ, Marine Biologist

Scientific Partner:
Dr. Daniel MARTIN, Centre d'Estudis Avancats de Blanes, CSIC, Spain

Area : South America

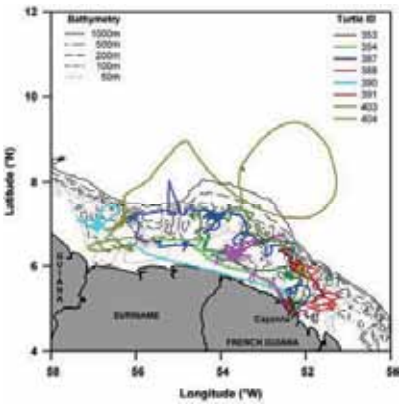
Country : French Guiana

Client : HARDMAN

2006-2007

Towards a sustainable management of the sea

Coordination of scientific research program on sea turtles off French Guiana



Project description

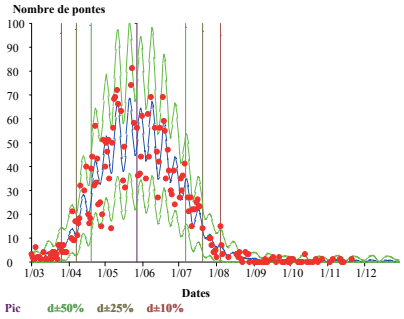
In 2005, Hardman wishes to carry out a seismic recognition campaign off French Guiana. For this purpose, the company must apply for a work opening authorization.

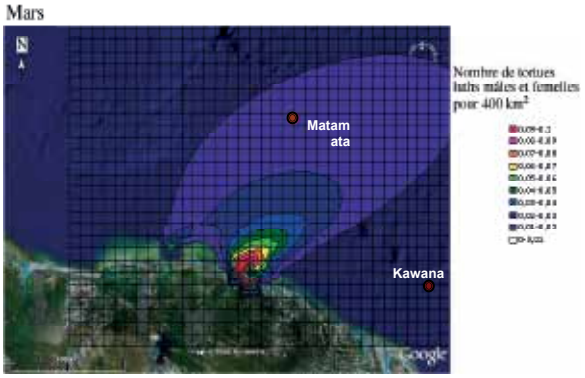
This campaign involves a scientific research program aiming at improving our knowledge of sea turtles biology and of natural and anthropogenic disturbances of their environment.

CREOCEAN had to initiate the research program and to coordinate the biologists researchers interventions.

Services supplied

- Selection of research teams
- Involvement in the scientific program development : fly over 2 sites offshore, satellite tracking, search for pollutants in turtle tissues, creation of a predictive model for the turtles presence in the sea
- Getting the approval of the procedure from the authorities
- Coordination of the team





Starting date: January 2006
Completion date: June 2007
Value of services: 90 000 €

Name of key experts:
Dr Eric DUTRIEUX, coordinator

Partner:
Pr Marc GIRONDOT, Orsay University, France

Towards a sustainable management of the sea

Area Gulf of Aden
Country YEMEN
Client TOTAL

2008-2009

Corals Biodiversity Research Study: from Mukalla to Aden

Project description

Corals along the southern coast of Yemen were observed for the first time in 1998. Although some specific studies showed their richness, no real assessment of the coral diversity was undertaken. The objective of this project was to assess the coral biodiversity in this area including the revision or the description of this un-described fauna.

Services supplied

- To constitute a team including the highest scientific authorities in the field of coral taxonomy
- To organize and carry field missions in various locations representative of the South Yemeni coast (Mukalla, Burum, Biralli, Balhaf, Aden)
- To participate in the field missions with the scientists
- To take professional and technical underwater photographs
- To coordinate the edition of a scientific field guide of the corals of Yemen

Starting date: March 2008
Completion date: December 2009
Value of services: 300 000 Euros

Name of key experts:

Eric DUTRIEUX, Project Manager, Creocean, France
Michel PICHON, Coral Specialist, France
Francesca BENZONI, Coral specialist, Milano Bicocca University, Italy
Claude-Henri CHAINEAU, Biologist, Total, France

Area : Middle-East **2009-2011**

Country : Qatar

Client : Exxonmobil

PAM fluorometry for monitoring health of corals and seagrasses along the coast of Qatar

Towards a sustainable management of the sea

Project description

Qatar exhibits vast seagrass beds and coral reef assemblages that have been and continue to be impacted by naturally fluctuating conditions as well as the intense development of the coast of Qatar. These ecosystems are of important ecological value and developing better techniques for monitoring health is needed to develop more effective strategies for conservation.

The aim of this survey was to evaluate the efficacy of PAM chlorophyll fluorometry technique as a means of assessing sub-leathal stress (i.e: health status) in corals and seagrasses along the Qatari coast as well as calibrate and validate this technique for future ecosystems monitoring applications in this local environment.

Therefore three coral reef sites and two seagrass sites were surveyed at each specific season to monitor their health state with PAM measurements and other traditional methods in order to detect changes over time, some which may not be observed by traditional methods.

Services supplied

- Survey of the ecosystems using a traditional Belt Transect methodology and collecting PAM (Pulse Amplitude Modulation) data on corals and seagrasses
- Light intensity measurements
- Long term temperature data collection
- Water quality measurements
- Fauna and Flora recording

Starting date: May 2009
Completion date: December 2010
Value of services: 526 492 €uros

Name of key experts:

Eric DUTRIEUX, Coordinator
Cécile RICHARD, Project Manager/Coral Specialist
Edouard HÖRLIN, Marine Biologist
Romain LEGALL, Marine Biologist

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6 - MAIN RELEVANT REFERENCES

The following list presents some of the recent projects managed by CREOCEAN all over the world.

Project description	Client	Country	Year
Mahakam delta biodiversity and mangrove restoration. R & D long term project	TOTAL E&P RESEARCH & DEVELOPMENT	INDONESIA	2011-2014
GXT ION French Guiana 2D seismic Exploration Project. Environmental Impact Assessment for the DOT (Request for commencement of work)	GX TECHNOLOGY	FRENCH GUIANA	2014
Assistance for underwater video recordings in Ras Laffan	URS QATAR LLC	QATAR	2014
Environmental Impact Assessment (EIA) related to the 4D seismic acquisition survey of Al Khalij Field	TOTAL E&P QATAR	QATAR	2014
Coral Relocation and monitoring at Halul Island for NPCC	NATIONAL PETROLEUM CONSTRUCTION COMPANY (NPCC)	QATAR	2014
Technical feasibility study for the protection against erosion of the hotel called «Les Roches» and of the Kourou beach	GUIANA SPACE CENTER	FRENCH GUIANA	2014
Introduction of PAM (Pulse Amplitude Modulation) technology for Sensitive Ecosystems Monitoring along the coast of Qatar.	EXXONMOBIL RESEARCH QATAR LIMITED	QATAR	2009-2014
Preliminary bathymetric survey in the Gulf of Salwa	EXXONMOBIL RESEARCH QATAR LIMITED	QATAR	2014
Analysis of erosion conditions West of «Cap Lopez» and stabilization solutions assessment	TOTAL E&P FRANCE	GABON	2014
Shell French Guiana exploration project: pre and post-drilling bio-sedimentary study	SHELL EXPLORATION AND PRODUCTION France SAS	FRENCH GUIANA	2013
Shell French Guiana exploration project: Regulatory documents - Environmental Impact Assessment (EIA) for 8 wells drilling	SHELL OIL COMPANY - SHELL FRENCH GUIANA	FRENCH GUIANA	2013
Shell French Guiana exploration Project. Regulatory document. Environmental Impact Assessment (EIA) for seismic operation	SHELL OIL COMPANY - SHELL FRENCH GUIANA	FRENCH GUIANA	2013
Seawater desalination plant project of OCP (Office Chérifien des Phosphates) in Safi (Morocco): evaluation of the water column quality (sampling), hydrodynamic study and modeling of discharge plume.	CABINET MERLIN	MOROCCO	2013
Corals transplantation in Ras Laffan and Halul Island within the framework of the installation of submarine cables between Ras Laffan and Halul Island	LS CABLE & SYSTEM	QATAR	2013-2014
Doha New Port Project - relocated seagrass monitoring and sediment dispersion study	MEDCO (Middle-East Dredging Company Q.S.C.)	QATAR	2013
Studies Development for ExxonMobil Research Qatar Environmental Laboratory (EMRQ)	EXXONMOBIL RESEARCH QATAR LIMITED	QATAR	2011-2013
Doha New Port Project - Dewatering Management Plan - Sediment Dispersion Study	MEDCO (Middle-East Dredging Company Q.S.C.)	QATAR	2013
Study of currents in the Gabon estuary	PERENCO	GABON	2013
Regulatory filings for the removal of cable Channel «ULYSSES 1	VERIZON FRANCE	UNITED KINGDOM	2013
Environmental monitoring of the Rabat water-treatment plant outfalls into the sea	CREOCEAN MOROCCO-AMENDIS	MOROCCO	2013
Quality control and analysis of bathymetric data support on Myanmar	TOTAL	BURMA	2013
Underwater video recordings at Halul Island - Qatar	HALUL OFFSHORE SERVICES Co. W.L.L.	QATAR	2013
Shell French Guiana exploration project: Evaluation of the impact on the resource of seismic surveys - additional fishing campaign of acoupa weakfish	SHELL EXPLORATION AND PRODUCTION France SAS	FRENCH GUIANA	2013
Assistance for environmental services related to the development of a gas pipeline in Mozambique	TECHNIP	MOZAMBIQUE	2013
ExxonMobil project for DNA study of marine biodiversity	EXXONMOBIL RESEARCH QATAR LIMITED	QATAR	2013
Shell French Guiana exploration Project: Protocols for characterization of marine mammal populations	SHELL EXPLORATION AND PRODUCTION France SAS	FRENCH GUIANA	2013

Project description	Client	Country	Year
OXY Petroleum - Marine Environmental Survey	URS QATAR LLC	QATAR	2013
Bathymetric surveys of Cayenne beaches	FRENCH GUIANA ENVIRONMENT DEPARTMENT	FRENCH GUIANA	2013
Iran and Qatar coast Mapping - Environmental Expertise	TTI PRODUCTION (TELEDETECTION AND IMAGES PROCESSING)	IRAN/QATAR	2013
Marine Environmental Baseline Survey (French Guiana) including modeling of dredged materials dispersion	SHELL OIL COMPANY - SHELL FRENCH GUIANA	FRENCH GUIANA	2012
Environmental Impact Assessment for seismic and drilling operations in French Guiana within the framework of new permit extension	SHELL EXPLORATION AND PRODUCTION France SAS	FRENCH GUIANA	2012
Balhaf marine biodiversity monitoring services	YEMEN LNG	YEMEN	2012
Experimental study of the colonization of artificial substrates by corals	TOTAL E&P RESEARCH & DEVELOPMENT	YEMEN	2012
Environmental Impact Assessment (EIA) study related to the 4D seismic acquisition survey of Al Khalij field	TOTAL E&P QATAR	QATAR	2012
Definition of the technical specifications for a geophysical survey offshore Gabon	TOTAL	GABON	2012
EBS (Environmental Baseline Survey) before the construction of a coal-fired power plant in Morocco	MOTT MACDONALD	MOROCCO	2012
Yachting Development study at the port of Al Hoceima in Morocco	MOROCCO PORTS DIRECTION	MOROCCO	2012
Fishes and invertebrates biodiversity Research & Development Study in Mahakam delta.	PT. EOS Consultants (INRR)	INDONESIA	2012
Marine Environment Baseline Survey – Jarnain and OS-IIA Platform Project	BUREAU VERITAS	UAE	2012
Pilot study for the use of satellite imagery for coastal mapping of Qatar	EXXONMOBIL RESEARCH QATAR LIMITED	QATAR	2012
Studies of the impact of brine discharges from desalination of seawater - Development of a tool for decision aid	AGENCE FRANCAISE DE DEVELOPPEMENT		2012
Calculation of design wave conditions for the design of a coastal protection work located inThiawlène area in Rufisque - SENEGAL	SEAMAR ENGINEERING	SENEGAL	2012
Stability calculation note for coastal protection works located in the district of Thiawlène Rufisque (Senegal).	SEAMAR ENGINEERING	SENEGAL	2012
Request for assistance in the preparation (technical specifications, tender) of a bathymetric survey in South-East Asia.	TOTAL SA	SOUTH-EAST ASIA	2012
Feasibility study for the banks development of the Casamance River in Ziguinchor, Senegal	ZIGUINCHOR CITY COUNCIL	SENEGAL	2012
Carbon sequestration by seaweed farming along the Qatar coastline. First step: evaluation of the resources in Hormophysa algae	QATAR DIAR VINCI CONSTRUCTION	QATAR	2012
Guyane Maritime Block, French Guiana : GM-ES-1 Exploration drilling environmental assessment	TULLOW OIL, HARDMAN PETROLEUM FRANCE SAS	FRENCH GUIANA	2011
Qualitative characterization of the marine environment near the drainage channel arrival into the sea of the Tanger water-treatment plant and near the former Tanger network drainage channel.	VEOLIA	MOROCCO	2011
Environmental monitoring of the water-treatment plant of Tetouan in Morocco: characterization of the marine environment, sampling/measurements campaigns, analysis and interpretation of the results.	VEOLIA	MOROCCO	2011
Environmental Monitoring Survey of Total offshore sites in Gabon	TOTAL SA	GABON	2011
Agitation study and sizing of protection works on the coast of the Cape Verde in Dakar (Senegal) peninsula. Protection dike of the west-facing ledge (Mermoz), sizing at the prior-project level	SEAMAR ENGINEERING	SENEGAL	2011
Feasibility study for the protection of the coastline of the Island of Gorée (Dakar, Senegal)	SEAMAR ENGINEERING	SENEGAL	2011
Metocean study assessments in North Tyrrhenian/Ligurian Sea within the framework of a LNG (Liquefied natural gas) project	OLT OFFSHORE LNG TOSCANA	ITALY	2011
NGYSM-1 : Environmental study offshore Gabon - Extension of the drilling authorization	MPDC NGUMA LTD (subsidiary of MPDC Gabon Co Ltd - Mitsubishi Corp)	GABON	2011

Project description	Client	Country	Year
Technical Assistance Mission and sediment assessment for a marina development in Playa Vista. Agitation study and effects on the beach/cliff erosion and access. Stage 1: bibliography and preliminary analysis. Stage 2: field mission Stage 3: analysis and assessment report	PUBLIC TEST AND STUDIES LABORATORY-HYDRAULIC STUDIES CENTER	MOROCCO	2011
Preliminary Method Development for Laboratory Studies for ExxonMobil Research Qatar (EMRQ)	EXXONMOBIL RESEARCH QATAR LIMITED	QATAR	2011
Study of the cruise sector within the framework of the construction of the ferries and cruise terminal of Zadar (Croatia)	EGIS INTERNATIONAL	CROATIA	2011
Environmental Impact Study prior to the realization of a new energy port in Jorf Lasfar	Ports and Maritime Public Ownership Direction (DPDPM)	MOROCCO	2011
Creation of a production factory of drinking water on desalination of sea water in Cape Verde - Environmental Studies	CABINET MERLIN	CAPE VERDE	2011
Study for the sustainable development of Ha Long bay and the surrounding area	AGENCE FRANCAISE DE DEVELOPPEMENT	VIETNAM	2011
Introduction of PAM (Pulse Amplitude Modulation) technology for Sensitive Ecosystems Monitoring along the coast of Qatar.	EXXONMOBIL RESEARCH QATAR LIMITED	QATAR	2009 - 2010
EIA studies for improving fisheries ports infrastructures of three sites in Yemen (Al Hodeidah, Al Khawbah and Nishtun)	EGIS BCEOM	YEMEN	2010
Environmental baseline Survey (EBS) offshore Al Khalij Fields	TOTAL EXPLORATION & PRODUCTION	QATAR	2010
Socotra-Yemen coral reefs biodiversity study	TOTAL EXPLORATION & PRODUCTION	YEMEN	2010
Benthic study - Yémen	TOTAL	YEMEN	2010
Yas Island MEBS	BLUE SEA ENVIRONMENTAL CONSULTANT EST	UAE	2010
Environmental Baseline Study - Umm Shaif and Zakum Fields (ABU DHABI)	BLUE SEA ENVIRONMENTAL CONSULTANT EST FOR ADMA OPCO	UAE	2010
Environmental baseline Survey (EBS) offshore Al Khalij Fields	TOTAL E & P	QATAR	2010
Climatic cartography of the Maldives to define coral reefs sensitivity to major climate changes	FIT GROUP	MALDIVES	2010
Environmental impact assessment updating within the framework of an offshore exploration oil drilling off Guiana coasts, French Guyana	TULLOW OIL plc	FRENCH GUIANA	2010
Benthos sampling and analyses within the framework of the Guyana 2010 Water Act	ENVIRONMENT DIRECTION OF GUYANA	FRENCH GUIANA	2010
Impact Assessment study of the Red sea to Dead Sea water conveyor project	BRL INGENIERIE	NEAR EAST	2010
Balhaf corals transplantation and monitoring - Additional transplantations : Golf Area and Outfall	YEMEN LNG COMPANY LTD	YEMEN	2007 - 2009
2009 Coral monitoring of the Balhaf area during marine construction work	YEMEN LNG COMPANY	YEMEN	2009
Ras Laffan port extension project : Marine environmental study at JV4 borrow area : out survey	JAN DE NUL DREDGING LTD/ BOSKALIS WESTMINSTER MIDDLE EAST LTD/RAS LAFFAN JOINT VENTURE	QATAR	2009
Underwater video survey (Qatar-Bahrein Causeway Project)	COWI A/S	QATAR	2009
Coastal and marine habitat mapping (Sumaysimah - Qatar)	KOHN PEDERSEN FOX ASSOCIATES (INTERNATIONAL) PA	QATAR	2009
Soil sampling in the Borrow Area QBA1	MEDCO (Middle-East Dredging Company Q.S.C.)	QATAR	2009
EBS and EIA for Das Island (Abu Dhabi)	HDMA-OPCO	UAE	2009
Coral biodiversity study in Yemen (areas of Burum, Aden and Red Sea) and genetic analysis - Year 2	TOTAL E & P RESEARCH & DEVELOPMENT SAS	YEMEN	2009

Project description	Client	Country	Year
Sensitivity Mapping of the South Coast of Yemen from Balhaf to Mukalla	TOTAL EXPLORATION & PRODUCTION	YEMEN	2009
Atlas of suitable sites for establishing aquaculture in Oman	MINISTRY OF FISHERIES WEALTH DEPARTMENT OF AQUACULTURE	OMAN	2009
Concession agreement for the construction, the development and the operation of a container terminal in Fernao Dias : Environmental and Social Impact Assessment (ESIA)	TERMINAL LINK STP SA	SAO TOME	2009
Preliminary assessment of monitoring programmes for 3 water treatment plants in Donegal (Ireland) : general approach and case studies	VEOLIA EAU	IRELAND	2009
Underwater video survey (Qatar-Bahrein Causeway Project)	COWI A/S	QATAR	2008
Audiovisual service within the framework of corals transplantation in Yemen in 2006 and 2007	TOTAL	YEMEN	2008
Marine Science/Dive operations safety plan-Al Dur IWPP - Bahrain	WSP GROUP	DUBAI	2008
Coral monitoring service in balhef area	YEMEN LNG COMPANY	YEMEN	2008
Sea water and seabed samples at QVC process water outfall	QATAR VINYL COMPANY (QVC)	QATAR	2008
Sensitivity mapping for the coast of Qatar Phase II - Western coast and Halul Island	SUPREME COUNCIL FOR ENVIRONMENT AND NATURAL RESSOURCES	QATAR	2008
Coral biodiversity study in the areas of Mukalla and Bir Ali and genetic analysis	TOTAL E & P RESEARCH & DEVELOPMENT SAS	YEMEN	2008
Environmental Impact Assessment - Tanger Med 2 project	TMSA - TANGERMED	MOROCCO	2008
Transplantation of corals and preparatory works for creation of artificial reefs	YEMEN LNG COMPANY LTD	YEMEN	2007
Participation to a coral translocation operation in Dubaï	EMEG	UNITED ARAB EMIRATES	2007
Ras Laffan port extension project : Marine benthic Survey around JV4 borrow area	JAN DE NUL DREDGING LTD/ BOSKALIS WESTMINSTER MIDDLE EAST LTD/RAS LAFFAN JOINT VENTURE	QATAR	2007
Coral biodiversity study in Balhaf area, Yemen	YEMEN LNG COMPANY LTD	YEMEN	2007
Bibliographical study on the range of tide in Libya - Soussa and Derna projects.	SIDEM (Industrial Sea water Desalination Company)	LIBYA	2007
Grab rental for 8 days	URS QATAR LLC	QATAR	2007
Environmental assessment of the surrounding of "The Pearl" project area and evaluation of the impacts of QDC "the pearl" dredging activities in the West Bay and Doha Bay areas.	QATAR DREDGING COMPANY	QATAR	2007
Environnemental Monitoring Survey Services - Al Khalij Field- Block 6	TOTAL QATAR	QATAR	2007
2007 coral monitoring of the Balhaf area during marine construction works	YEMEN LNG	YEMEN	2007
Study of the Guyana North-West coastal erosion	WEST FRENCH GUIANA COUNTY COUNCIL	FRENCH GUIANA	2007
Evaluation of the mangrove affected by the golf project (Colon City, Panama)	SANTA MARIA GOLF & COUNTRY CLUB	PANAMA	2007
3D hydrodynamical and hydro sedimentary modellings int the framework of the Dredging Impact Assessment Study for the Misurata (Libya) port deepening	PRIVATE CLIENT	LIBYA	2007
Environmental Baseline Survey of the PARS LNG Project - Complementary survey.	TOTAL	IRAN	2006
2006 coral monitoring of the Balhaf area during marine construction works	YEMEN LNG	YEMEN	2006
Environmental baseline survey of the area to be dredged for the enlargement project of the Doha airport - N1 / E1 areas .	GEMS INTERNATIONAL	QATAR	2006
Sampling of water and sediment for the environmental baseline survey of the area to be dredged for the enlargement project of the Doha airport - N1 / E1 areas.	GEMS INTERNATIONAL	QATAR	2006

Project description	Client	Country	Year
Water Quality and water movement modeling of marine works in the framework of the Saraya Aqaba resort project.	LACECO	JORDAN	2006
New Doha International airport - JV Ndia supplementry marine survey ; Additional offshore borrow area (E2).	GEMS INTERNATIONAL	QATAR	2006
Mitigation and compensation measures PARS LNG Project EIA.	TOTAL	IRAN	2006
Socio-economic survey in the framework of an EIA study of A seismic campaign in Lybia.	TOTAL/URS	LIBYA	2006
Coastal Zone Environmental Mapping and Management Plan Implementation on Qatar Eastern Coasts.	SUPREME COUNCIL FOR ENVIRONMENT AND NATURAL RESSOURCES	QATAR	2006
Environmental monitoring of "the Pearl Qatar Project".	QATAR DREDGING COMPANY	QATAR	2006
Environmental survey prior to sediment dredging in access channel-pearl island project	QATAR DREDGING COMPANY	QATAR	2006
Dredgings Ecological survey in Aquarius Borrow Area (Pearl of the Gulf project) .	QATAR DREDGING COMPANY	QATAR	2006
Environmental Baseline Study & Environmental Impact Assessment study of three exploration wells offshore French Guyana in deep waters.	HARDMAN RESOURCES	FRENCH GUIANA	2006
3D models of accidental oil spill evolution in the framework of the Environmental Baseline Study & Environmental Impact Assessment study of three exploration wells offshore French Guyana in deep waters.	HARDMAN RESOURCES	FRENCH GUIANA	2006
Environmental Baseline study of the Pars LNG project - Tombak Iran.	TOTAL	IRAN	2005
Environmental impact assessment study of the area to be dredged for the enlargement project of the Doha airport.	JOINT VENTURE JVNDIA (QDC)	QATAR	2005
Environmental assessment of the marine area of Balhaf LNG plant site - Yemen LNG Project.	TOTAL	YEMEN	2005
File for dredging permits - Pearl of the Gulf project - Zone D -North	QATAR DREDGING COMPANY	QATAR	2005
Monitoring campaign of coral reef in Kuwait.	SAFEGE KUWAIT BRANCH OFFICE	KUWAIT	2005
Application for the Khor Al Adaid to be nominated as a UNESCO World Heritage site.	UNESCO	QATAR	2005
Complete environmental study for dredging permit (Safaliya Island Project)	QATAR DREDGING COMPANY	QATAR	2005
New Doha International Airport Environmental Background Monitoring	NDIA JV (NEW DOHA INTERNATIONAL AIRPORT JOINT VENTURE)	QATAR	2005
Measurement of different parameters in sea water near a factory in Sultanate of Oman.	SPF TKP OMIFPRO SNC	SULTANATE OF OMAN	2005
Environmental monitoring of "Port of the Gulf" project in Qatar	UDC	QATAR	2005
Pearl of the Gulf - Study within the framework of the environmental monitoring programme .	QATAR DREDGING COMPANY	QATAR	2005
Stock evaluation of Red coral along the Algerian shore-line. Management Plan.	ALGERIAN MINISTRY OF FISH RESOURCES	ALGERIA	2005
Environmental Baseline study of the Pars LNG project - Tombak Iran.	TOTAL	IRAN	2005
Study related to the effects of seismic reflexion onto turtles offshore French Guyana .	HARDMAN RESOURCES	FRENCH GUIANA	2005
Environmental and social impact Assessment. Tunu High Resolution survey site (HiRes project).	TOTAL	INDONESIA	2005
Baseline survey of different waters in Guyana district in appplication to the European framework contract.	ENVIRONMENT DIRECTION OF GUYANA	FRENCH GUIANA	2005
Tunu LP Compression project - Environmental and societal Baseline study.	TOTAL	INDONESIA	2005
EBS of the TUNU LP (Low Pressure) gas compression platfrom - North Indonesia.	TOTAL	INDONESIA	2005
Benthic environmental survey for the monitoring programme of Ras Laffan oilfield area (Shell Qatar Offshore project).	SHELL QATAR	QATAR	2004
Dilution study for the effluent of the Ras Nabi Younes wastewater treatment plant.	GEOCEAN	LEBANON	2004
Pearl of the Gulf Island Project. Requested dredging area Zone D - Ecological survey	QATAR DREDGING COMPANY	QATAR	2004

Project description	Client	Country	Year
Environmental study for Shrimp Aquaculture project in Oman.	BINTOUT SEAFOOD PRODUCTS LCC	SULTANATE OF OMAN	2004
Pearl of the Gulf Island Project. Requested dredging area Zone B - Ecological survey	QATAR DREDGING COMPANY	QATAR	2004
Pearl of the Gulf Island Project. Access channel Ecological survey	QATAR DREDGING COMPANY	QATAR	2004
Environmental baseline survey (EBS) and environmental and social impact assessment study (ESIA) of Tambora gas layer in Indonesia.	TOTAL	INDONESIA	2004
Sisi Nubi Phases 1 & 2 and Peciko Phase 5 project. Environmental baseline study.(Indonesia).	TOTAL	INDONESIA	2004
Environmental study for TUNU X gas development project in Indonesia.	TOTAL FRANCE	INDONESIA	2004
EBS of the TUNU Phase 10 Oil&Gas project in Indonesia.	TOTAL FRANCE	INDONESIA	2004
Impact study of the domestic effluents discharge - Abu Al Bukhoosh oilfield platforms (Abu Dhabi).	TOTAL ABK	UAE	2003
Update of the Environmental Baseline Survey in the South Pars region(Iran).	TOTAL	IRAN	2003
Environmental baseline study and Environmental Impact assessment – Kharg Island Dorood Project (Iran).	TOTALFINAELF	IRAN	2003
Bathymetric survey of Salalah port and the access channel.	IPEDEX	SULTANATE OF OMAN	2003
Monitoring of coral reefs in Koweit : estimation if impacts due to the 1st Gulf War and implementation of a multi-annual monitoring.	SAFEGE KUWAIT BRANCH OFFICE	KUWAIT	2003
Environmental study for Shrimp Aquaculture project in Oman.	ASMAK	SULTANATE OF OMAN	2003
Bathymetry and sedimentology survey for the extension of Duqm, Al Shannah and Salalah Harbour.	IPEDEX	SULTANATE OF OMAN	2003
Environmental Baseline Survey (EBS) for an offshore oilfield in Angola (Block 3).	TOTALFINAELF	ANGOLA	2003
Environmental Baseline Survey (EBS) for Akpo-Amenam pipeline route - Nigeria.	TOTAFINAELF	NIGERIA	2003
Environmental prediagnosis of the marine oil terminal of pivdenniy - Ukraine (Black Sea).	JSC UKRTRANSNAFTA	BLACK SEA	2003
Environmental baseline survey (EBS) of the Moho Bilondo oilfield.	TOTAL CONGO	CONGO	2003
Experimental study of the impact of spoil of drilling on sea-beds and recolonization processes - oilfield of N'Kossa (Congo) - experimental Program of the COPREB.	TOTAL	CONGO	2003
Mahakam delta environmental baseline survey.	TOTAL	INDONESIA	2003
Environmental baseline study and Environmental Impact assessment – Kharg Island Dorood Project (Iran).	TOTALFINAELF	IRAN	2003
Bathymetry and sedimentology survey for the extension of Duqm, Al Shannah and Salalah Harbour.	IPEDEX	SULTANATE OF OMAN	2003
Impact study of the extension of Tripoli harbour.	BEST	LEBANON	2002
Goro Nickel Project - Impact assessment study for the construction of a nickel and cobalt ore extraction and treatment industrial plant. New-Caledonia.	TECHNIP-COFLEXIP LCI	NEW-CALEDONIA	2002
Nigeria OPL 246 field area environmental baseline study.	TOTAL UPSTREAM NIGERIA	NIGERIA	2002

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Marine and consultancy services

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