

COMPANY PROFILE

International



creocean

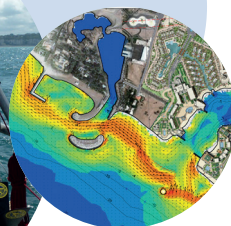
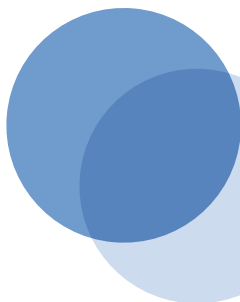
Environnement & océanographie

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1 - Creocean key points

1.1 Creocean overview

Marine environment, coastline planning and oceanography have been at the heart of our work for over 70 years along the entire French coastline and for more than 30 years abroad.

Our diagnostic, appraisal and recommendation work lies within the «Sustainable Development» dynamic by allowing projects to evolve alongside economic development of maritime territories whilst respecting environmental issues.

Creocean by the numbers :

a company part of the independent Keran group : **520** employees, turnover of **€49M** in 2017, including **20%** abroad

€12.5M

in 2017, including
40% abroad

70

employees
in 2017

13

professions

13

agencies

8

OPQIBI certifications

Certifications :
SSE (OHSAS 18001)
In development :
QUALITY (ISO 9001)

1.2 Creocean a company of KERAN

Creocean belongs to KERAN, an independent private group, providing global services in support of land and environmental development.

Alongside Keran's other companies, we share a global approach to coastal and offshore planning projects. Together, we provide a complete offer, constantly striving for integrated and sustainable planning and management.

KERAN ORGANIZATIONAL CHART



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 Aménagement & environnement	 creocean Environnement & océanographie	 groupe huit Développement urbain	 naomis Systèmes d'information
Turnover 2017 : € 33,7 M€ Staff : 420 (100 % of the capital)	Turnover 2017 : € 12,5 M€ Staff : 70 (97,5 % of the capital)	Turnover 2017 : € 1,5 M€ Staff : 11 (95 % of the capital)	Turnover 2017 : € 1,6 M€ Staff : 20 (100 % of the capital)

Five international subsidiaries:

- GROUPE SCE Algérie (Algeria)
- GROUPE SCE Maroc (Morocco)
- CREOCEAN Doha (Qatar)
- KERAN Afrique de l'Ouest (KAO) – West Africa
- CREOCEAN Océan Indien – Indian Ocean



1.3 Creoccean's background and commitment

1.3.1 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
1991	Merger / absorption of CREO and ECOCEAN giving Creoccean
1997	IFREMER sells its shareholding to ITI group (SCE / FIT / SNEDA)
2003	Creation of GROUP SCE which acquires 95 % of Creoccean capital
2014	New identity of the Group SCE becoming KERAN
2016	Creation of the subsidiary Creoccean Indian Ocean

More than 70 years after CREO's creation, we are proud to carry on this legacy: respecting scientific ethics, upholding 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.

1.3.2 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, Creoccean has nurtured a functional vision of Sustainable Development in the marine environment.

Creoccean is committed 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 Creoceen provides address 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. Creoceen 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, Creoceen has conducted scores of projects linked with coastal and offshore environments. Creoceen 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, Creoceen can listen to, understand, and meet the requirements of its customers. In doing so, Creoceen continues to develop its legacy of long-term relationships based on satisfied customers.



1.3.3. Creoccean's HSE policy

Our professions lead us to regularly intervene at sea to collect data on the environment that is dear to us, in sometimes difficult conditions.

« La mer est un espace de rigueur et de liberté. Y perdre la rigueur c'est perdre la liberté. », Victor Hugo

(Translation: The sea is a place of rigor and freedom. To lose rigor is to lose freedom)

In 2013, Creoccean's management initiated a process to set up an HSE management system (Health, Safety and Environment) to ensure the safety of people and the preservation of the environment in all our activities, in the field as in the office. For this purpose, the «HSE Team» was created to develop the system from the OHSAS 18001 standard and to make it live on a daily basis.

This initiative was based on the conviction that these themes must be at the forefront of all our concerns but also to meet the requirements of our industrial customers.

As a symbol of our commitment and effectiveness of the actions implemented, the Creoccean head office in La Rochelle obtained in July 2018 the OHSAS 18001 Certification from Bureau Veritas.



To achieve the «zero accident» objective, our «HSE Charter» includes ten topics from which we have created a policy to control the risks associated with our activities with rigor and method but also to keep on improving at all times.

Today, one of the strengths of our HSE management system is the preparation of an «Implementation and Prevention Plan» for each field operation. The purpose of this document is to describe the operations from an organizational point of view and to evaluate the associated risks in order to reduce them to an acceptable level.

For the coming years, our ambition is to consolidate our achievements in terms of management of health and safety at work, both in the field and at the office, and to amplify our reflection on the environmental dimension of our activities in order to control their impact on the environment and to contribute to the preservation of biodiversity.

Our HSE charter is detailed hereafter.



1.3.4 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

Creocean has the following OPQIBI (Organisme Professionnel de Qualification de l'Ingénierie Bâtiment Industrie) certifications :

PROJECT MANAGEMENT ASSISTANCE (PMA)

0103 - Technical assistance to the contracting authority

SOIL TECHNIQUES

1003 – Geological studies

HYDRAULIC, MARITIME AND FLUVIAL PLANNING AND WORKS

0810 – Assessments in river or marine settings

1107 - Study of river works

1821 - Engineering of channels, riverside construction, water flow, currents in harbors

ENVIRONMENTAL ASSESSMENT

0611 - Environmental assessment of the plans, the schemes and the programs

0612 - Environmental assessment of projects, works and facilities

BIODIVERSITY AND ECOLOGICAL ENGINEERING

0701 - Study of ecosystems. Assessment of flora and fauna



1.4 Creoccean in France

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

1.5 International development

Creoccean supports its international presence and projects with agencies/subsidiaries in the Middle East (Doha-Qatar), in South America (Salvador de Bahia- Brazil) and in the Indian Ocean (Sainte-Clotilde - Island of Reunion). Creoccean 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





2 - Capability statement

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

Using our large array of oceanographic tools, Creoccean proposes customized environmental approaches to each project, taking into account the nature of the project, environmental characteristics of the area, and the client's needs. We can intervene at an early stage of any industrial or coastal development project to help the client develop the proposed activity in an environmental-friendly manner and throughout the life of the project.

Indeed, with a team of 70 employees, creoccean 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, governmental 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.



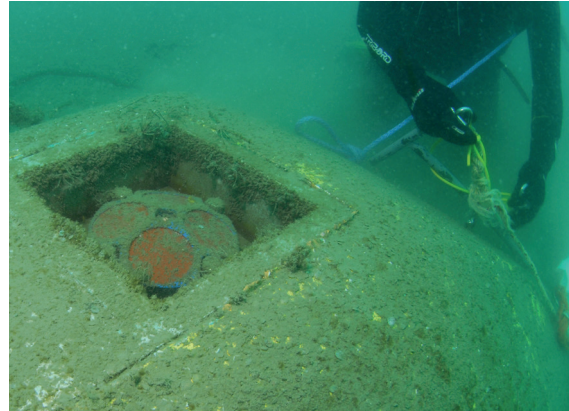
2.1 Physical properties, marine habitat mapping, and biodiversity assessment

At an early stage of any development project, preliminary data are necessary to know the potential of the area for the project and the physical and natural constraints if any. Such feasibility 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.



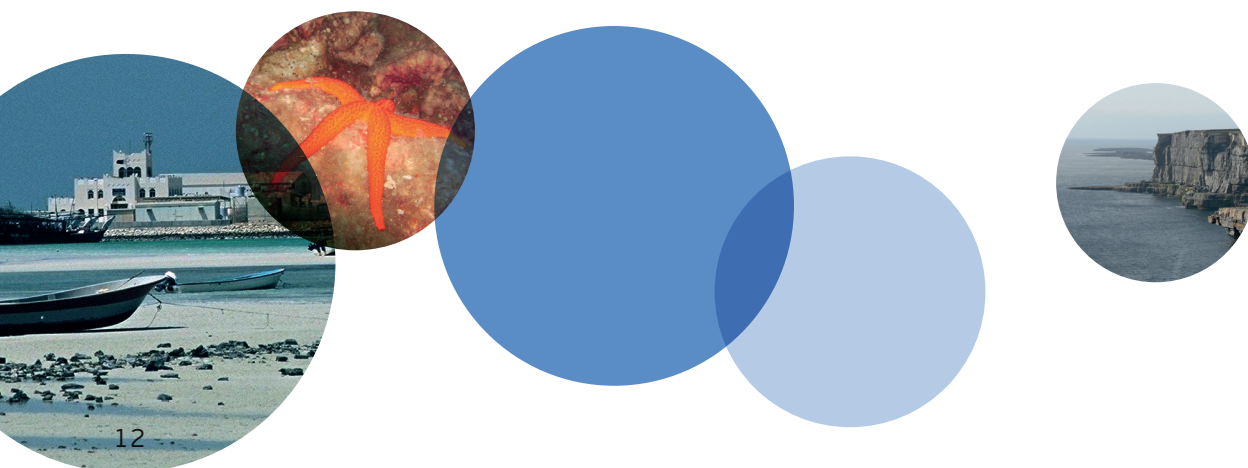
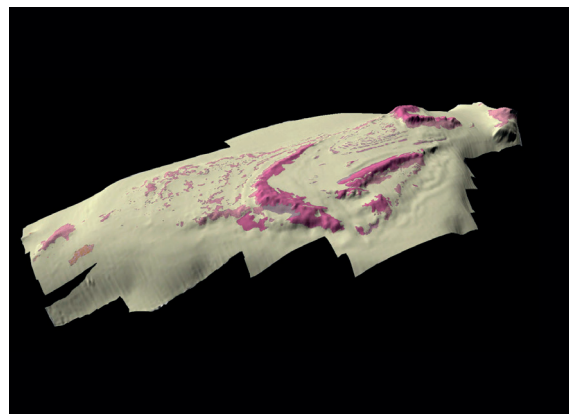
Creocean has generated such data in support of the construction of ports, dredging projects, the laying of submarine pipelines, construction of ocean outfalls, the installation of offshore wind farms and marine power generating units, and for projects addressing shoreline erosion and/or accretion.

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.



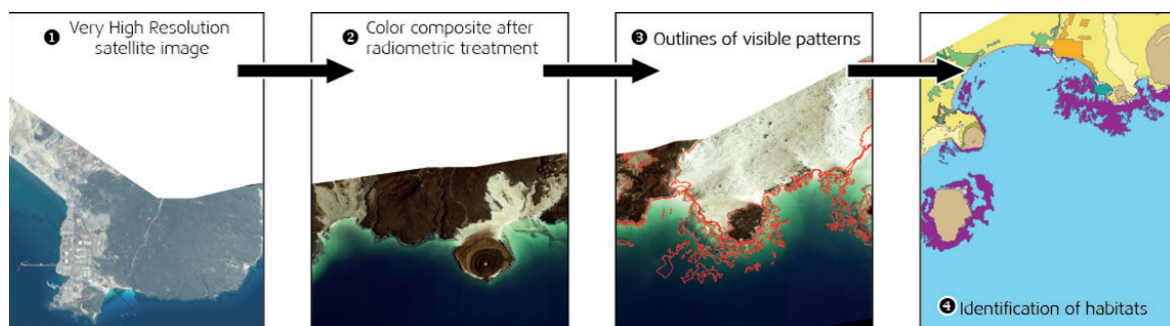
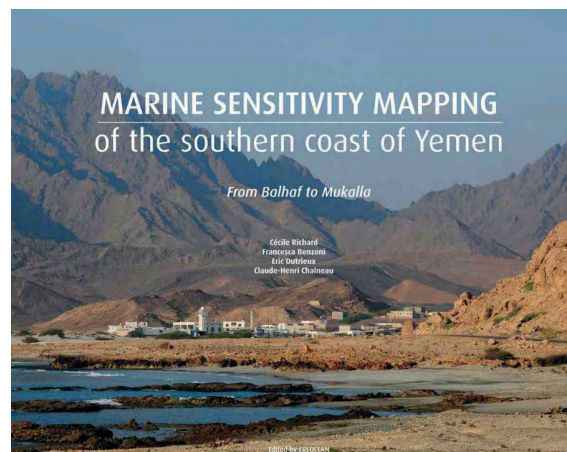
2.1.3 Marine and coastal habitat mapping and biodiversity assessment

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 Creoccean allows the identification of these very valuable areas by associating satellite image processing and interpretation, and field work expertise including scientific diving, underwater photography and in situ observations and biota description.

Our ecological maps generate sensitivity maps easily understandable by decision makers, as and used as planning tools for conservation and sustainable development. Users include governmental organizations such a Ministry of the Environment and private companies such as the Oil & Gas industry.

Creoccean is also capable of conducting in-depth biological inventories in sensitive and biologically-rich areas (open water and seafloor fauna and flora, marine habitats). Collaboration with researchers allows the identification of fauna and flora to the species level.



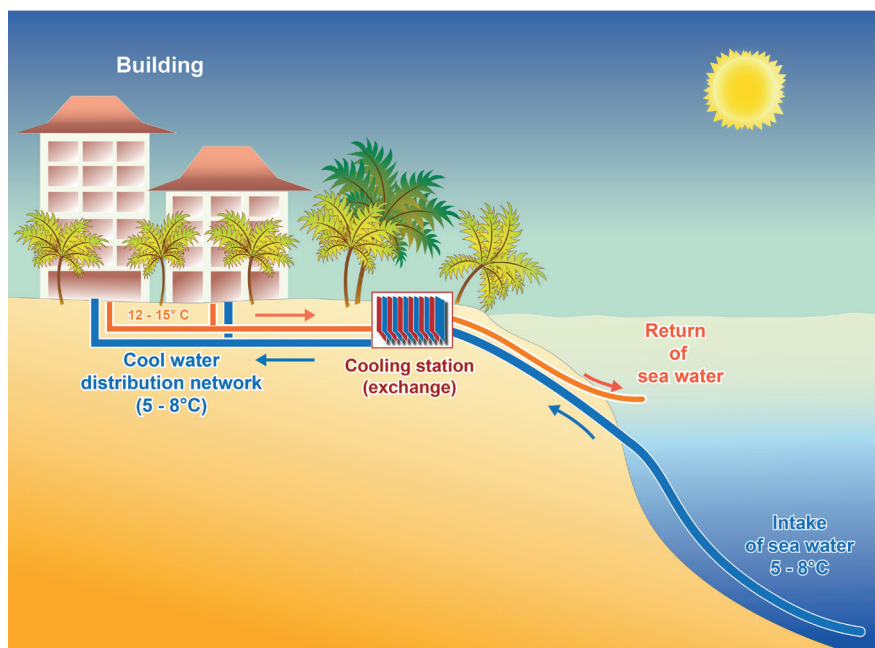
2.2 Coastal Engineering

Based on the potential of the area, Creoccean 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.

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

Furthermore, Creoccean 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.

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



2.3 Environmental studies

Environmental Impact Assessments (EIAs) are, in most cases, a regulatory process required by governmental authorities in most countries today. In addition they can be required by a financial institution (World Bank, International Financial Corporation) 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. Supporting studies are sometimes necessary such as hydrodynamic modeling which Creoccean can also conduct.



2.3.1 Environmental Baseline Studies (EBS)

Creoccean has proven experience and capabilities of conducting EBS'. Tools developed by Creoccean allow to work for any project and in any site, from very shallow areas (lagoons, mangroves, coral reefs) to deep offshore seafloors. Creoccean will tailor the EBS to site-specific requirements.

Typically, baseline studies can include the description and analysis of the following environmental characteristics all of which Creoccean can undertake :

- > Metocean data acquisition
- > Water assessments (hydrodynamics, chemistry, biology)
- > Sediment analyses (chemistry, trace metals, hydrocarbons, pollutants)
- > Benthic faunal and floral assessments in hard and soft bottom areas
- > Fish and fisheries assessments
- > Marine mammal, sea turtle and sea bird assessments
- > Detailed mapping of the study area (remotely-sensed and in situ data)
- > Sensitivity and vulnerability assessments.

Creoccean's in-house expertise is supported by a wide range of instrumentation and sampling equipment to conduct ship-based and in-water studies including grabs, nets, CTD probes, sampling bottles, SCUBA equipment, ROV, video, and a PAM Fluorometer (Pulse Amplitude Modulation).

Creoccean can acquire generate the data needed for 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 Impact Assessment (EIA)

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 World Bank standards IFC N°6 for large industrial projects such as the extensive Shell exploration project offshore French Guiana.

2.3.3 Complementary studies: hydrodynamic modeling

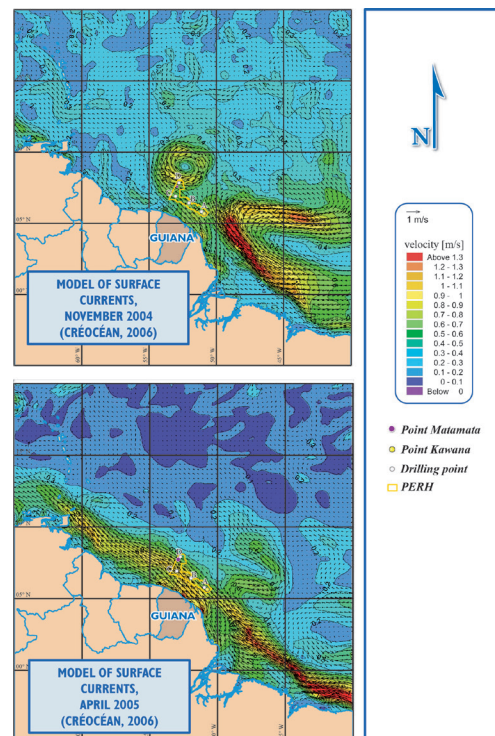
During the process of the ESIA, Creocean can implement complementary studies aiming to generate information on the fate of any discharged substance.

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:

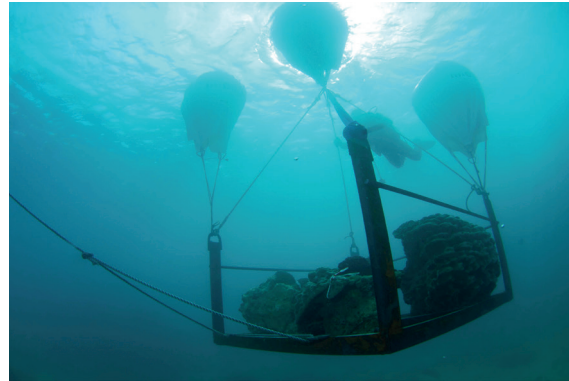
- > circulation models of coastal waters in order to evaluate the impact of wastewater outfalls on marine water quality;
- > harbor oscillations used to design coastal structures, defense works or offshore wind farms;
- > marine submersion models to define overland flooding (within the framework of plans 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 spill modeling.



2.4 Implementing mitigation measures

Creocean can develop mitigation measures to advise the client on how to minimize the impact of a project during the phases of construction or operations. These recommendations can be part of the EIA and proposed in the Environmental Management Plan. They can also be designed and implemented during the life of the project based on observed effects or risks.

Mitigation measures are project-specific ranging from small recommendations such as improvements of construction methods statement to major proposals including physical protection of ecosystems or marine habitats (for example the use of silt curtains to protect corals against turbidity plumes), or relocation of sensitive species to a safe place. As an example, Creocean has a substantial experience in successfully relocating corals from areas where they would otherwise be exposed to potential impacts.



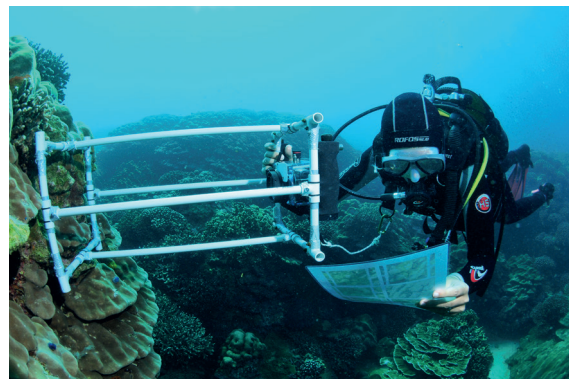
To develop mitigation measures, Creocean experts ranging from engineers for the design of any system to marine ecologists. Again this multidisciplinary approach is specific to Creocean.

2.5 Monitoring performance

During the life of a project it is necessary to measure environmental compliance of a project owner. Monitoring can also be applied to natural control areas such as Marine Protected Areas. 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 the description of marine fauna and flora, 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

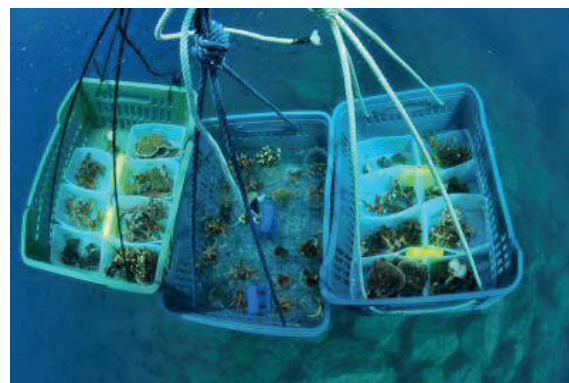
Due to project residual impacts, or due to unexpected marine habitat damage including naturally-occurring diseases, it can be necessary to restore the ecological value of an area and especially its biodiversity, richness and ecological functionality.

Creocean has developed various methods adapted to such situations. They include mangrove and seagrass restoration, coral relocation, coral propagation, and the design, construction and deployment of artificial reefs.

Such operations require combined 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.

In some cases, expertise in sedimentology, hydrodynamics and chemistry is also necessary.

Creocean will assemble all these experts to conduct truly multidisciplinary and 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

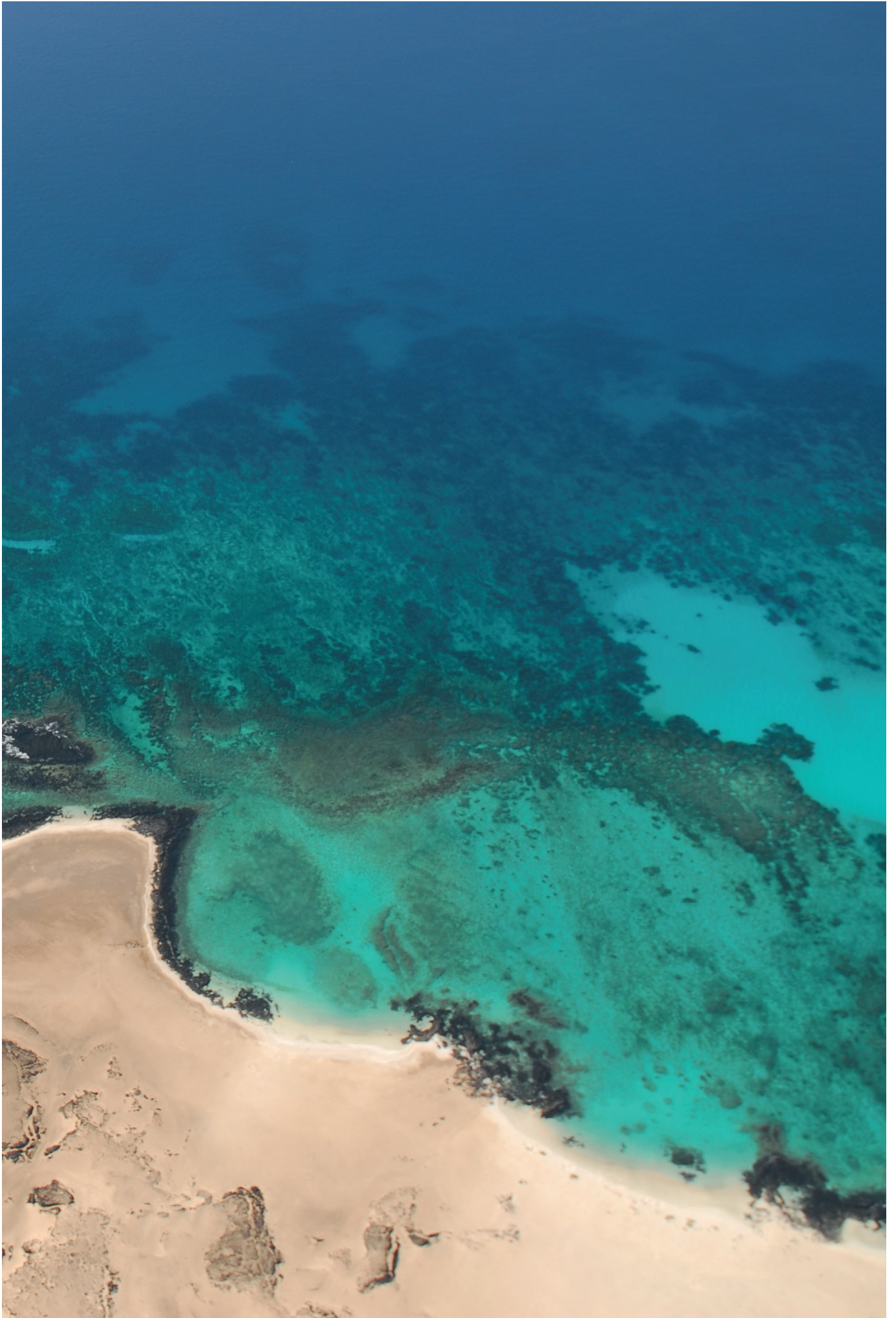
Creocean uses state of the art oceanographic tools and acquires the best performing equipment. However, some projects require specific tools not yet commercially available or that have yet to be developed. With its Research and Development department and team, Creocean develops new tools related to various 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 generated a number of scientific publications and books available to the scientific community.





3 - Staff and organization

In 2018, Creoclean employs 70 people including more than 40 experts representing all areas of marine science. Creoclean 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 project manager and a team of Creoclean experts best suited to address project-specific requirements. The project manager is the customer's dedicated point of contact.

3.1 Direction



Yves GILLET
Chairman

Forerunner of sustainable development, at the origin of the SCE French company project and development, which he has been managing for 34 years, Yves Gillet created the Keran group in 2003 around an ambition: to contribute to the development and management of territories at the service of men and in harmony with the environment. Since the beginning in 1982, he has inspired and supported the development of the group around 5 values: Proximity, Audacity, Trust, Talents, Commitment.

Man of conviction and active member of several networks of contractors, Yves Gillet is involved with the men and the activities that make up the territory. He is involved in the French Management Improvement Association (APM), the Entrepreneurs Network, the Western France leaders network and as administrator of the World Trade Center Nantes Atlantique run by the Nantes-Saint-Nazaire Chamber of Commerce and Industry.

In September 2017, he became Creocean Chairman.



Denis VALANCE
Chief Executive
Officer

Engineer «Polytech engineering school in Lille - France, Denis VALANCE joined ARCADIS for 10 years, then BURGEAP for 12 years in which he was successively Western Regional Director and Operational Director for France. His main technical skills are related to geostructures, earth sciences and environmental engineering. In addition to his role as technical advisor to his public and private clients throughout France and internationally, he has been managing and leading the SCE Environment Business (KERAN Group) since 2013, notably through the coordination of engineering interventions, SCE experts and partner structures.

In September 2017, he was appointed Crocean Chief Executive Officer.





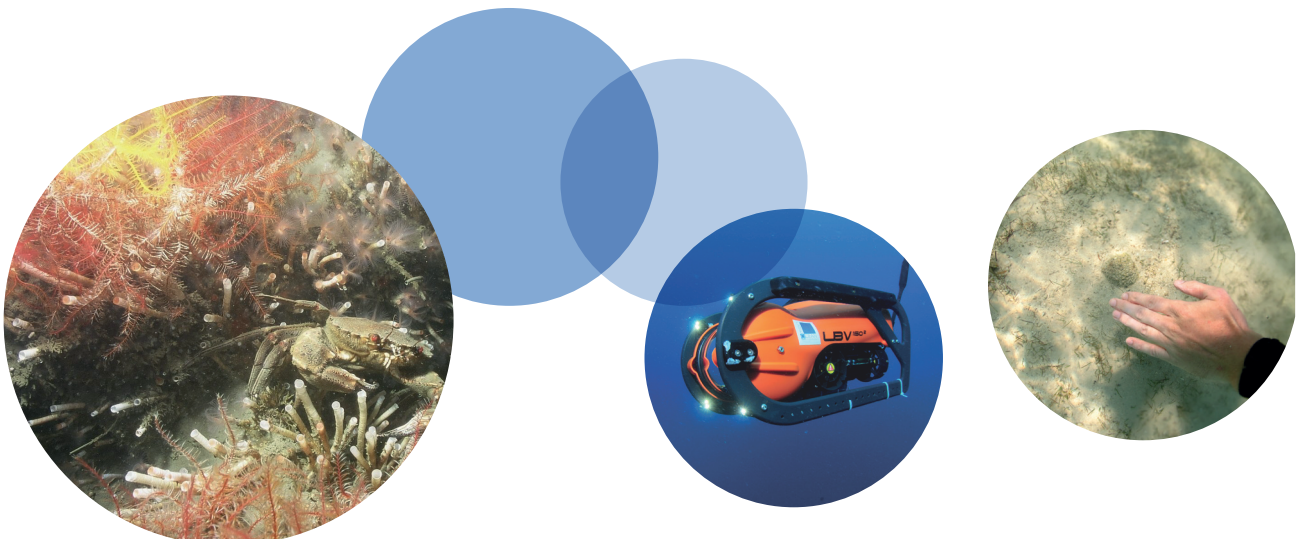
Eric DUTRIEUX
Deputy Chief
Executive Officer
for International
Development -
Creocean Indian
Ocean Chairman

Graduated from high school in agronomy (1984) and is a 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 consisted 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.



Rémi GARNIER
Creocean Indian
Ocean Director

Engineer in marine environmental studies at ARVAM between 1998 and 2003, then at Pareto Ecoconsult until 2015, he holds a post-graduate diploma in «Marine Environment» of the University of Marseille. Since 1998, he has supervised numerous projects in the Indian Ocean, in the French West Indies and internationally. His experience of international project manager has led him since 2010 to develop projects in different countries of the Indian Ocean and East Africa. He holds Hyperbaric Aptitude Certificates (CAH) Class IB and Confirmed Nitrox. He is the author of more than 100 reports and studies related to marine ecology, environmental diagnosis and the management of coastal zones under anthropogenic pressure. He has participated in several scientific publications on coral ecosystems. Since June 2016, he is Director of Creocean Indian Ocean and responsible for its commercial development.



3.2 Project Directors-Experts



Georges CLAVERIE

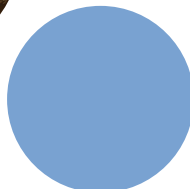
He received a diploma from l'Ecole Centrale de Nantes (French Engineering highly selective establishment) (Grandes Ecoles) in 1984, with a main expertise in Marine Engineering. He started working as project manager for CREO from 1986 to 1987. Starting in 1987, he was responsible for feasibility and design 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.

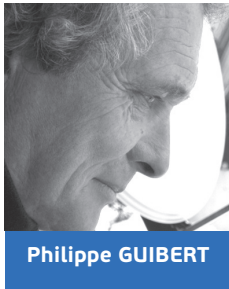
From 2004 to 2012, he was the head of the Hydrodynamics and Engineering Department consisting of a team of five engineers and PhDs. In 2013, he became Director of Coastal Development projects department.



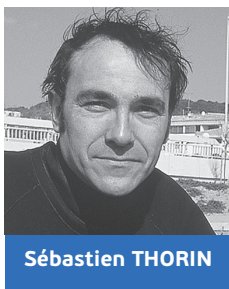
Michel COLINET

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





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 Creoccean 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 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 initially specialized in neurophysio-pathology. He went onto studying the ecological function of coral reefs, 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 Creoccean 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 Creoclean in the world

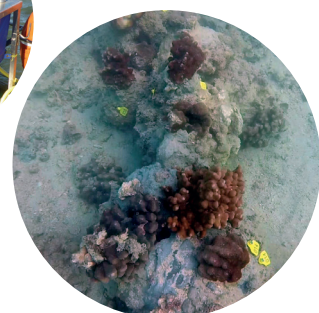
3.3.1 Headquarters

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

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 Creoclean 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 CEO, Denis VALANCE, 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



Béatrice
de GAULEJAC

Dr in marine biology (PhD) and professional scientific scuba diver, Béatrice de GAULEJAC has more than 15 years of experience in tropical marine and Mediterranean environments. She designs, creates and implements projects, research programs and field studies adapted to the problematics at hand.

As a projects director, biologist and scientific adviser, she has led multidisciplinary teams and has been involved in national and international projects in various domains: environmental diagnostics, resource management, creation of protected marine areas, management plans of natural areas of importance as well as impacts of infrastructures on the coastline.

She has been working for Creoccean in the Caribbean zone since 2015 and became the head of the Caribbean agency in November 2017.

3.3.3 Pacific zone



Julien
GUILLET

After ad-hoc interventions led by Creoccean in the territory of French Polynesia, Pacific Creoccean agency was created in 2007.

Directed by Julien GUILLET, Engineer in coastal and marine environment, who joined Creoccean in 2002, the agency has been involved in all areas of Creoccean's expertise, with, if needed the Creoccean 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 Middle East



Creocean has been based in the Middle East since 2003 with the opening of an agency in Doha, Qatar.

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 as required by Oil & Gas companies to dredging and construction companies.

The main targets of 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 & 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 new 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 multinational 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).

Since 2018, Creocean has its own subsidiary in Qatar, Creocean Doha.



3.3.5 South-East Asia

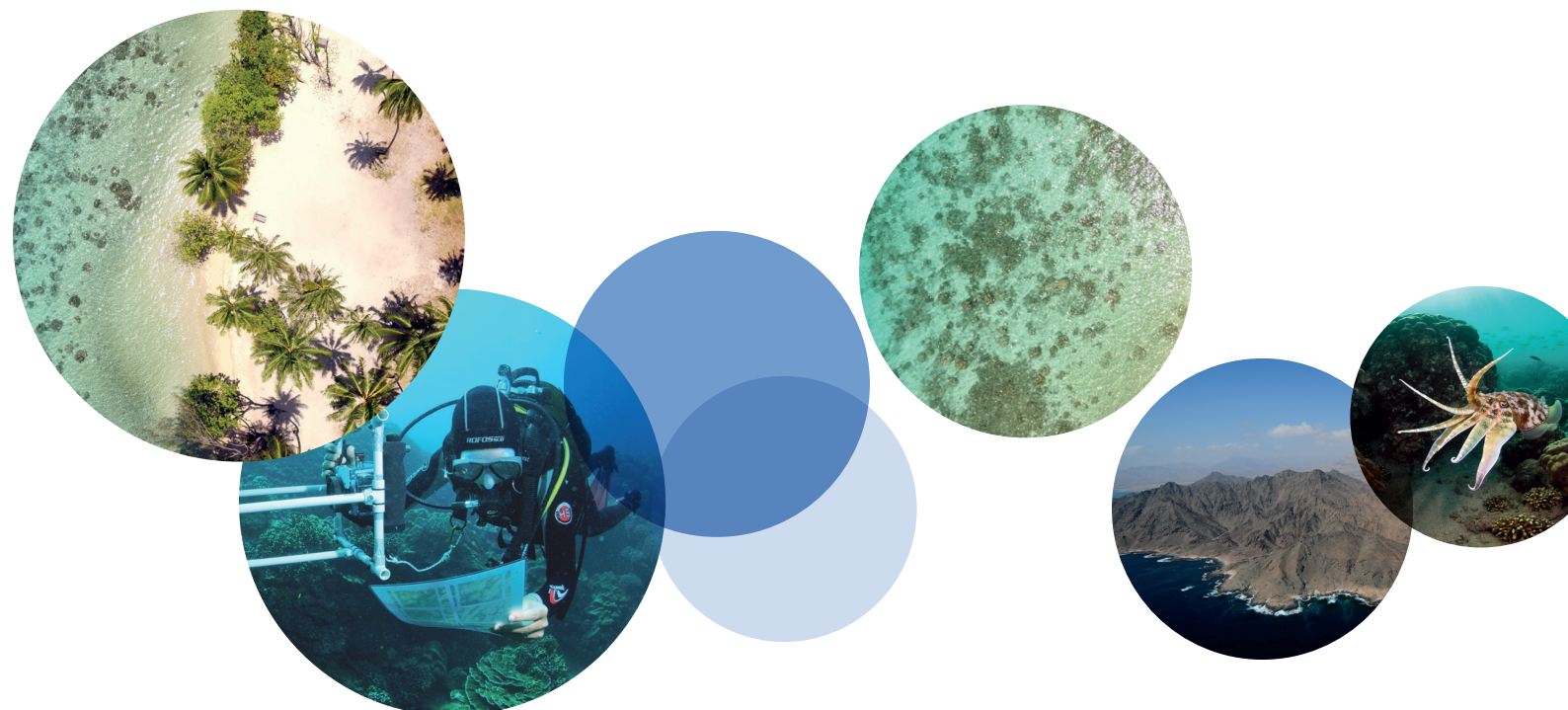


Eric
DUTRIEUX

Considering the huge size of its coastlines, its rapid economic growth and its incredibly rich marine biodiversity – represented by highly productive, yet sensitive, ecosystems such as coral reefs and mangroves – South-East Asia has a potentially strong need for marine environmental services. Consequently, Creoccean decided to create a branch in this fast-changing region. Primarily established in Vietnam in 2012, a partnership was then developed with an Indonesian geophysical company – Mahakarya Geo Survey (PT. MGS).

Our main objectives in this region are to assist local authorities, governments and private companies in their development or conservation plans. Successful projects have already been completed with Total E&P Indonesia, while we have been requested to submit proposals to Bruneian and Indonesian governments regarding marine biodiversity preservation. Our network of local partners is well-developed and still expanding, allowing us to respond and adapt quickly to almost any offer.

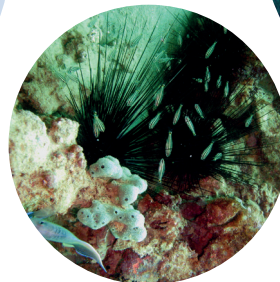
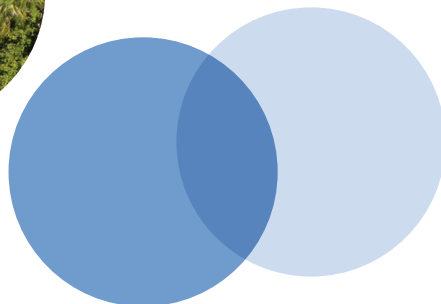
Now Creoccean South-East Asia is also willing to reinforce its action in Research & Development, as well as in the tourism and renewable energy sectors, by developing new partnerships and collaborations on specific assignments. In 2016, we are looking to export our activity to other neighboring countries, such as Philippines, Burma or Papua New Guinea.

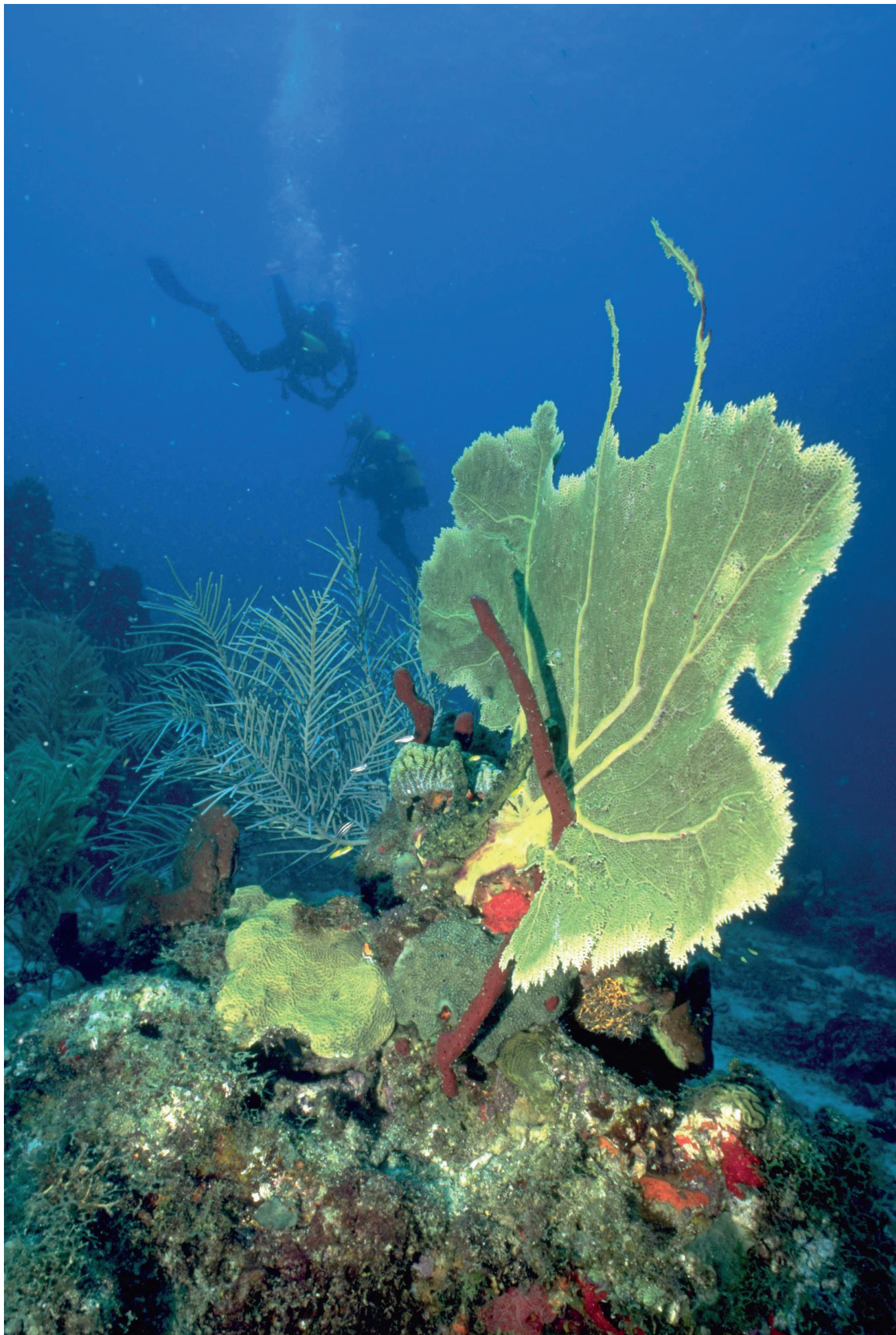


3.4. Experts and technicians

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

- > Marine hydrodynamics and numerical modeling
- > Marine engineering, civil engineering, and coastal engineering
- > Coastal development
- > Marine environmental impact assessments
- > Marine biology
- > Marine ecology
- > Integrated management of coastal and marine environments engineers
- > Geology
- > Geophysics
- > Sedimentology
- > Hydrobiology
- > Chemistry
- > Toxicology
- > Hydrographic data acquisition and processing
- > Cartography, graphic design, and illustrations
- > Professional/Scientific SCUBA diving
- > Land and underwater photography and videography





4 – Technical capabilities

4.1. Physical oceanography and modeling

Our competence

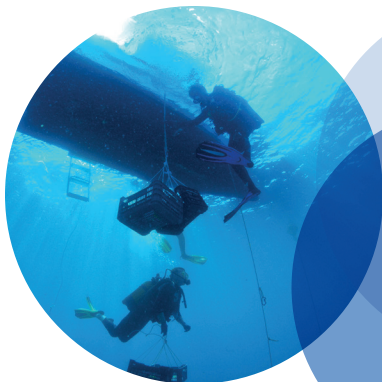
- > Assessing agitations (swells, waves, wind waves)
- > Assessing circulation and the movement of water masses (currents, tides)
- > Ability to measure, model, and forecast physical events

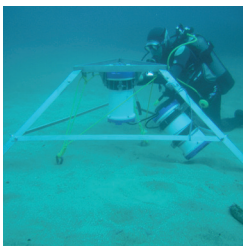

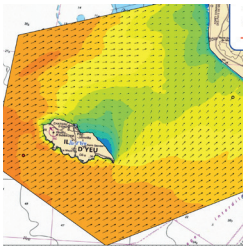
Our tools


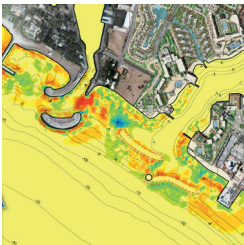
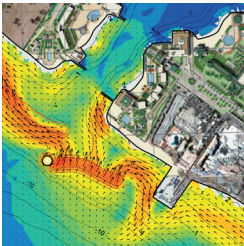
- > In situ physical measuring devices (including current meters, buoys)
- > 2D and 3D modeling software (currents, perturbations, hydro-sedimentary processes)

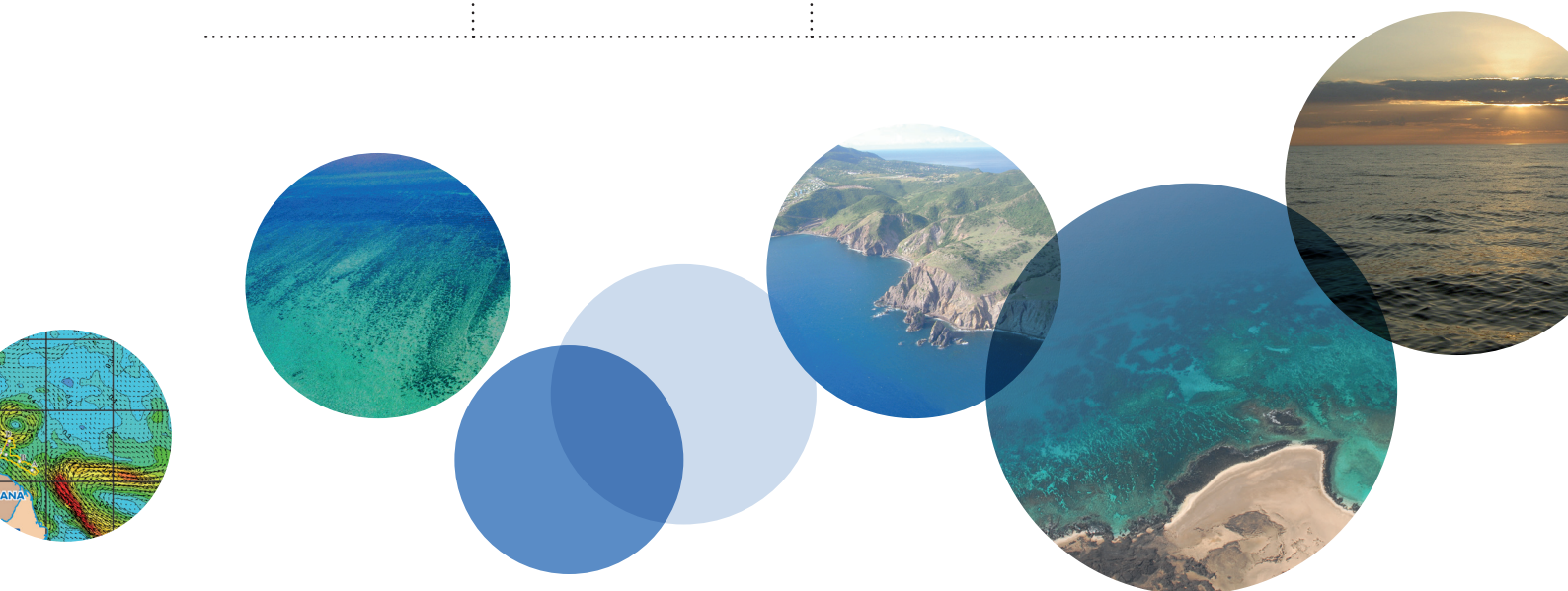
Objectives

- > 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 	Current meters: <ul style="list-style-type: none"> > AANDERAA RCM 9 > RDI Workhorse Sentinel current profiler 300KHz(1), 600KHz(2), and 1200KHz(3) with option bottom tracking. > RDI Sentinel V 100 	<ul style="list-style-type: none"> > 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	<ul style="list-style-type: none"> > Pressure & temperature sensors (NKE) > Sensors associated with current or wave measurement 	<ul style="list-style-type: none"> > Sea level time series graphs > Prediction software > Spectral and harmonic analysis
WAVE MEASUREMENT 	<ul style="list-style-type: none"> > RDI Workhorse Sentinel current profiler 300KHz(1), 600KHz(2), and 1200KHz(3) with wave option > Pressure sensor (NKE) > RDI Sentinel V100 > Non-directional Datawell buoy WR-SG > Triaxys Watch Keeper buoy 	<ul style="list-style-type: none"> > Significant wave height and period time series graphs > Max wave height time series graphs > Significant wave height and period histograms > Probability diagrams > Wave roses, wave spectral and directional energy distribution, wind/wave relationship diagram > Real time measurement
HYDRODYNAMICS 	<ul style="list-style-type: none"> > 3D Modeling with MIKE3D HD FM (DHI) > TELEMAC 2D (EDF/LNHE) > MARS 3D IFREMER) 	<ul style="list-style-type: none"> > Modeling of currents (sea, estuaries, rivers) > Taking into account general currents, tide, wind, variations in water density (temperature and salinity) > Hydrodynamic base for other models > Modeling of surges > Modeling of land flooding
SWELL, WAVES 	<ul style="list-style-type: none"> > MIKE SW (DHI) > MIKE BW (DHI) > SWAN (Delft) > TELEMAC ARTEMIS (EDF/LNHE) 	<ul style="list-style-type: none"> > Swell propagation toward the coast > wind-induced wave growth > Sea surface agitation induced by the wind > Extreme wave height asseswsment for design > Coupling with the hydrodynamic model for hydro-sedimentary modeling > Harbour agitation modeling > Potential wave energy estimation

MEASUREMENT	EQUIPMENT	DELIVERABLES
PLUMES, WATER QUALITY 	<ul style="list-style-type: none"> > MIKE 3D AD (DHI) > MIKE 3D PT/SA (DHI) > TELEMAC 2D (EDF/LNHE) > MARS 3D (IFREMER) > CORMIX 	<ul style="list-style-type: none"> > Modeling 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 	<ul style="list-style-type: none"> > MIKE 3D MT (DHI) > MIKE 3D ST (DHI) > TELEMAC (EDF/LNHE) > MARS 3D (IFREMER) > TRANSPOR (Van Rijn) > Specific developments 	<ul style="list-style-type: none"> > Modeling of transport, erosion and deposition : <ul style="list-style-type: none"> - 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 	<ul style="list-style-type: none"> > Coupling of various models 	<ul style="list-style-type: none"> > Modeling of littoral drift > Modeling 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 competence :



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

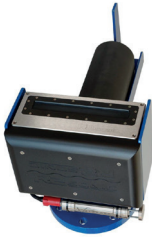
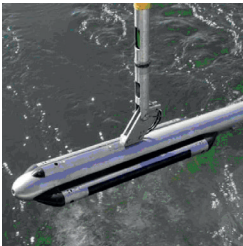


Our tools :

- > 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  GPS RTK	<ul style="list-style-type: none"> > RTK positioning <ul style="list-style-type: none"> - Thalès Pro FLex 800 - Thalès Z-max 	<ul style="list-style-type: none"> > Positioning chart > Centimetric positioning
UNDERWATER POSITIONING  USBL EASY TRACK	<ul style="list-style-type: none"> > USBL acoustic positioning <ul style="list-style-type: none"> - Easy track lite 	<ul style="list-style-type: none"> > Dynamic positioning of underwater equipment

MEASUREMENT	EQUIPMENT	DELIVERABLES
BATHYMETRY  R2 Sonic 2022	<ul style="list-style-type: none"> > Single beam bathymetric echosounder <ul style="list-style-type: none"> - Navisound 215 > Multi-beam bathymetric echosounder <ul style="list-style-type: none"> - R2 Sonic 2022 > Motion sensor <ul style="list-style-type: none"> - inertial unit Coda Octopus F185 R+ > Velocity probe <ul style="list-style-type: none"> - Valeport Mini SVS > Recording/Processing: <ul style="list-style-type: none"> - Hypack/Hysweep 2012 	<ul style="list-style-type: none"> > Position chart > Morpho-bathymetric map > 3D charts
SEAFLOOR SURVEYING 	<ul style="list-style-type: none"> > Side-scan sonar <ul style="list-style-type: none"> - KLEIN 3000 side scan sonar > Recording/Processing <ul style="list-style-type: none"> + Sonar Pro + CARAIBES software 	<ul style="list-style-type: none"> > Seabed nature map and sediment dynamics > Underwater wreck or obstacle location > Inspection of pipes or submerged structures > Protection of river banks and structures
SEISMIC AND SUB-BOTTOM SURVEYING 	<ul style="list-style-type: none"> > High Resolution Seismic equipment <ul style="list-style-type: none"> - Sparker SIG - Boomer SIG - Boomer IKB-Seistec - Streamer monotracer SIG > Recording/Processing: <ul style="list-style-type: none"> - IXSEA Delph seismic software > Sub-bottom profiler <ul style="list-style-type: none"> - INNOMAR SES 2000 systems 	<ul style="list-style-type: none"> > Isopachs of sedimentary deposits > Bedrock mapping
MAGNETOMETRY 	SEASPY Marine magnetometer	<ul style="list-style-type: none"> > Detection of metal objects

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

Our competence :


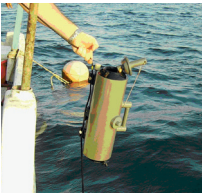




- > Physical and chemical properties of water and sediments
- > Urban, harbour and industrial environmental quality
- > Marine microbiology




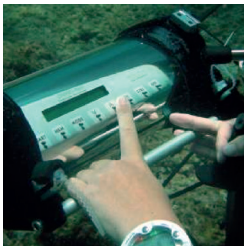
Our tools :

- > 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  Freegaff corer	> Different types of grabs: - Smith Mc Intyre grab - D-Grab - Van Veen Grab - Eckman grab - Free fall corer (cores of 1 to 2 meters) - Calciner - Oven	> Core analysis > Granulometry
HYDROBIOLOGY  Niskin sampler+  YSI probe 6920  Sambat probe	Water sampling bottles (Niskin-type) Multi parameters probes YSI 6920 and 6600 with different sensors: > Temperature > Conductivity > Pressure > Dissolved Oxygen > pH > Turbidity Probes and NKE data logger > STBD > SDOT > STPS > SP2T > Sambat probe with different sensors	 > Suspended solids (organic and mineral) > Nutrients (concentration and flux) > Chlorophyll, phaeopigment > Temperature, salinity, pH, dissolved oxygen > Phytoplankton and zooplankton > Macrofauna and meiofauna > Macrofloral algae 

MEASUREMENT	EQUIPMENT	DELIVERABLES
FLOW MEASUREMENT AND WASTEWATERS DISCHARGES  <p>HAC AS950 sampler</p>	<ul style="list-style-type: none"> > Automatic sampler Hach 	
 <p>Hydreka Mainflo Flowmeter</p>	<ul style="list-style-type: none"> > Flow measurement Mainflo type 	<ul style="list-style-type: none"> > Flow Measurements > Wastewater sampling and analysis > Analysis of flows
 <p>Safety mobile tripod</p>	<ul style="list-style-type: none"> > Multi-gas detector, > Safety equipment to intervene in a confined space 	
PHOTOSYNTHETIC PERFORMANCE  <p>PAM</p>	<p>PAM Fluorometer (Pulse Amplitude Modulation)</p>	<ul style="list-style-type: none"> > To monitor the health of corals, seagrass, algae



4.4. Coastal and marine ecology

Our competence :






- > Marine ecology and biology
- > Benthic ecology
- > Biological oceanography
- > Coral reef relocation and restoration
- > Coral reef ecology
- > Seagrass relocation and restoration
- > Experimental fisheries science
- > Coastal zone management
- > Mapping
- > Scientific/Professional SCUBA diving
- > Partnerships with specialized independent laboratories





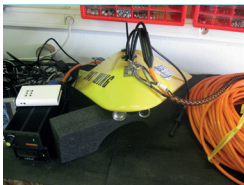
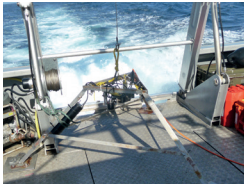

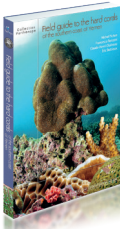
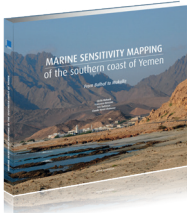
Our tools :

- > 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, mitigation, and ecological compensation.

MEASUREMENT	EQUIPMENT	DELIVERABLES
<p>BENTHIC MACROFAUNA</p>  <p>Auto siever system</p>  <p>Observation</p>  <p>Leica Binocular magnifier MD80</p>	<p>> Sampling grabs</p> <p>> Camera Leica IC80HD</p> <p>> Microscope</p> <p>> Leica Binocular magnifier MD80</p> <p>> Oven and calcination oven</p>	 <p>> Biosedimentary sampling</p> <p>> Screening</p> <p>> Determination of benthic macrofauna</p> <p>> Biomass by calcination</p> <p>> Macrofauna and meiofauna</p> 

MEASUREMENT	EQUIPMENT	DELIVERABLES
BONGONET 	<ul style="list-style-type: none"> > Plankton net > Bongo net for ichthyoplankton > Flow meter 	<ul style="list-style-type: none"> > Phytoplankton, Zooplankton and macro algae (eggs, fishes larvae, crustaceans ...) observation and sampling
	Beam trawl : <ul style="list-style-type: none"> - Big = CP3M - Small = CP1.6M 	<ul style="list-style-type: none"> > Sampling of ichthyofauna, including Juveniles. In coastal and estuary zones
VIDEOS AND PHOTOGRAPHIES  <p>ROV LBV 150 SE²</p>	Professional SCUBA diving equipment ROV : Seabotix LBV 150 SE ² USBL (Vehicle ordered at distance) positioning system (option)	<ul style="list-style-type: none"> > Video inspection, inventories
	Photogrammetry and aerial shots equipment <ul style="list-style-type: none"> > Quadricopter UAV (French S1, S2 and S3 approval) with 12 Mp sensor > Hexacopter UAV (French S1, S2 and S3 approval) with 24.3 Mp sensor 	 <ul style="list-style-type: none"> > Video and photo inspection, inventories > Photogrammetry (orthomosaic and DSM / DTM) > Virtual reality / augmented reality
 <p>Tow wing</p>	Photographic and Video equipment <ul style="list-style-type: none"> > Canon G12 and G16 > Nikon D80, D200, D300, D800 > Sea and Sea, Ikelite and Isotta housing > Flash Ikelite and Nikon SB105 > Macro and large objectives angle > Underwater LED Camera and Lamp > GoPro Camera > Hugyfot housing > Led Euclia Lamp with great power and autonomy > Cage for camera > Trailed wing > Acoustic positioning (USBL) (optional) > Video Recorder > EDIUS6 editing software > Video Overlay TXT 	<ul style="list-style-type: none"> > Corals and benthic assessment > Standard coral monitoring results > Photograph database > Field guides books 
 <p>Support «DropDown camera»</p>		
 <p>Hugyfot housing with surface system</p>		 

creocean in the world



MARTINIQUE



GUADELOUPE



NEW CALEDONIA



FRENCH POLYNESIA
TAHITI



LA RÉUNION

- Study areas
- Keran agencies
- Creocean agencies

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