Cedre Information BULLETIN

Feature

Grounding of the *T.S. Taipei* in Taiwan

Studies

Fate and impact of oil in the mangroves of French Guiana

N° 36 - August 2017

CONTENTS

Information BULLETIN Cedre

Centre of Documentation,
Research and Experimentation
on Accidental Water Pollution

N° 36 - August 2017
A Cedre bi-annual publication
715, rue Alain Colas
CS 41836 - 29218 BREST CEDEX 2
FRANCE
Tel.: + 33 (0)2 98 33 10 10
www.cedre.fr

Publication Manager:
Stéphane Doll

Editor-in-chief:
Christophe Rousseau

Formatting and Graphic Design:
Annie Tygréat
Illustrations: Natalie Padey
Translation: Alba Traduction

Printing: CLOÎTRE Imprimeurs,
Saint-Thonan

ISSN: 1247-603X
Legal deposit: August 2017

Cover photo:
© Geographic Information
Technology Co., Ltd.

Available for download at: www.cedre.fr

subscription
free upon request to contact@cedre.fr

A strong and lasting relationship

Clean, healthy and productive seas, well-functioning marine ecosystems and sustainable use of associated goods and services: these are the targets shared by all the stakeholders involved in France's marine environment. They are also the ambition defined internationally by Sustainable Development Goal 14 (SDG) and by the European Marine Strategy Framework Directive (MSFD), whose aim is to reach or maintain a good ecological status for the marine environment by 2020.

On a national level, the French law on reclaiming biodiversity, adopted in summer 2016, lays down the notion of ecological damage. It also establishes several measures related to the protection of the marine environment, such as fishery conservation areas (in particular to protect hatcheries and nurseries), and to the obligation for French ships over 24 m long travelling through the Pelagos (Mediterranean) and Agoa (Antilles) sanctuaries to be fitted with systems to prevent collision with cetaceans.

Today, through its original status, Cedre brings together public and private stakeholders to focus on the issue of response to accidental water pollution. The quality of the work accomplished over past years has convinced the ministry to continue to provide Cedre with long term support, in particular financially.

As evidence of this trust, the ministry has recently tasked Cedre with a new mission under the MSFD: to provide technical and methodological support on the issue of marine litter, placing it in charge of beach litter indicators. Through this action, protocols will be defined and the national surveillance network boosted.

This new partnership is a clear illustration of the work carried out by Cedre, at the crossroads between science and public policy, always with a pragmatic approach to field issues.

Stéphanie CUBIER,
Head of the Marine Environment Office at the Directorate of Water and Biodiversity
French Ministry for the Ecological and Inclusive Transition

EDITORIAL

FEATURE

Grounding of the *T.S. Taipei* in Taiwan

On the 10th of March, 2016, the *T.S. Taipei* ran aground in the coastal waters of Shimen in northern Taiwan. Fuel spilled out and caused extensive pollution in the neighboring area. As soon as the incident broke out, the government of Taiwan (R. O. C.) initiated a response action. It took the participating response experts more than 5 months to finish the actions of “marine pollution response” and “shipwreck removal” restoring the beauty of the Shimen coastal waters.

Incident site location

The incident

On 10th March 2016 around 10 a.m., a 15,487 GT container ship, the *T.S. Taipei*, registered in Taiwan (Republic of China, R. O. C.), lost its power due to engine failure in the northern coastal waters influenced by the strong northeastern winter monsoon. It was carrying a total of 505 m³ of fuel and oil (411, 42 and 52 m³ of fuel, diesel and lubricant, respectively) as well as 392 cargo containers (149 on deck and 243 in the cargo holds), including 9 containing hazardous substances.

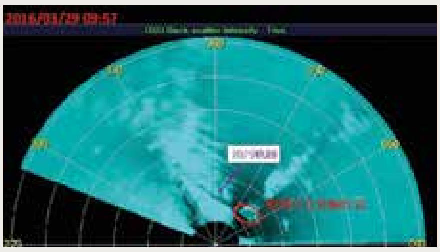
In winter, the northeastern winter monsoon creates rough seas in the area where the ship was. The waves can be as high as 6 m and the wind can reach level 12. In these rough conditions, *T.S. Taipei* ran aground 400 m from the northern tip of Shimen where the water was approximately 7 m deep. As the ship was aground, the hull suffered a breach and the ship started to take in water. Part of its fuel was spilled.

Emergency measures

All 21 crewmembers on board were rescued from the rough seas by 2 helicopters dispatched by the National Rescue Command Center at around 13:00 and dropped on land.

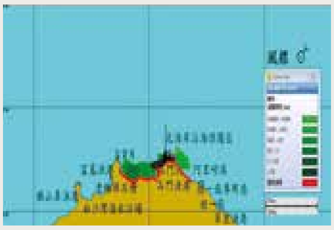
The grounding site was located in a highly sensitive environment containing fishing areas and tourist attractions, and two nuclear power plants. To prevent the pollution from spreading, the Environmental Protection Administration (EPA) of Taiwan requested that the Ministry of Transportation and Communications (MOTC), Coast Guard Administration (CGA), New Taipei City Government and the ship owner hold the first response meeting at 15:00 at Shimen District Office, New Taipei City. This marked the beginning of the more-than-5-month response to the marine environment pollution caused by the *T.S. Taipei* and the following shipwreck removal process.

	THE SHIP:
Name:	*T.S. Taipei*
Construction:	Jiangsu Yangzijiang Shipbuilding Co., Ltd (2006)
Type:	Container ship
Deadweight:	20,615 tonnes
Gross tonnage:	15,487 gross tons
Length:	167 m
Width:	25.30 m
Draught:	10.20 m
Engine:	22,461 horsepower
Cargo:	392 containers including 9 containing hazardous substances
Bunkers:	411 m³ of fuel oil
Other oils:	42 m³ of diesel and 52 m³ of lubricants
Flag:	Taiwan
Owner:	TS Lines Co., Ltd.
Manager:	TS Lines Co., Ltd.



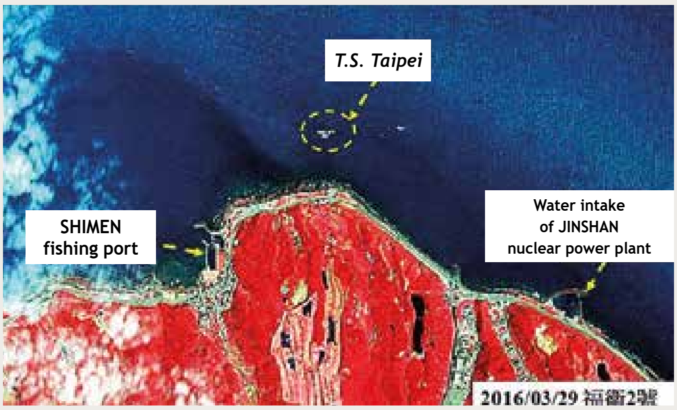
Radar monitoring


Radar monitoring


Modelling system


CCTV system


Surveillance pollution by UAS



Oil spill monitoring with FORMOSAT -2

Technical tools used to monitor the spill (photos © Response center)

Grounding of the *T.S. Taipei*

Protection measures and monitoring at sea

This incident attracted considerable attention from news media, the public and the government, which in turn placed enormous social pressure on the response center. As part of the initial response efforts, the government response team conducted the emergency deployment of coastal protection and response measures such as oil booms and oil absorbent ropes, to protect the coastlines, fishing ports and water intakes of the nuclear power plants before the ship owner's response team had established sufficient response capability.

In addition, helicopters were deployed for aerial inspection of the site and helped the professional maritime rescue engineers of the ship owner's response team to board the ship and assess the hull conditions for the salvage plan. The inspection indicated structural breach on the starboard side of the hull, indicating that the ship could not be towed. Therefore, the fuel, oil and hazardous substance containers on board had to be extracted as soon as possible to mitigate the risk of pollution.

Furthermore, the response center continued to monitor the hull and potential pollution on the water surface and along the coastline using satellite, an unmanned aircraft system (UAS), coastal surveillance radar, CCTV and other technical equipment, and stayed alert in predicting possible locations where oil might reach the coastline with an oil drift simulation system.

Extraction of onboard fuel and oil

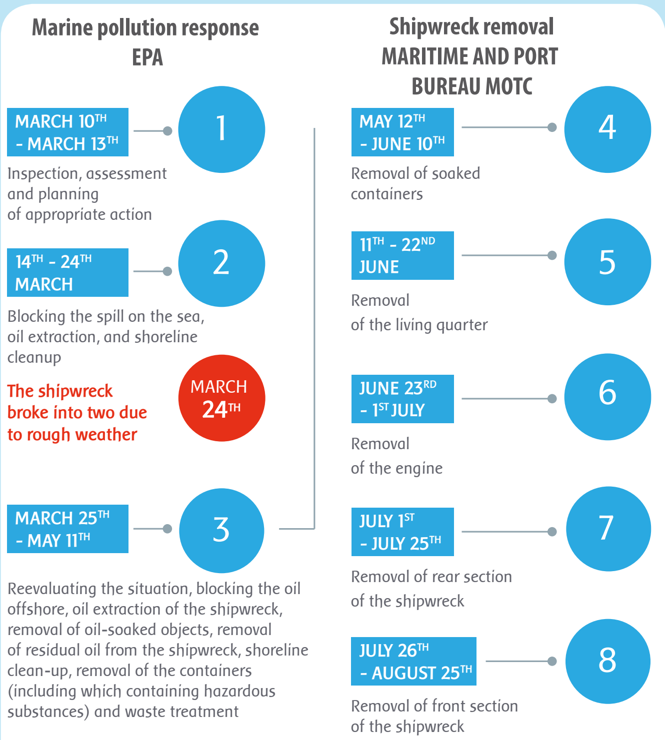
Once the ship owner's response team was ready to engage in the response action, the government's team maintained its response efforts in terms of monitoring, evaluation, coordination and consulting. The sea became calm on 16th March. Seagreen Enterprise, contracted by the ship owner, worked together with Nippon Salvage from Japan to board the ship to extract the fuel and oil. A quick onboard survey suggested that the stability of the stern was compromised and, therefore, it was safer to start fuel and oil extraction from the stern oil sumps towards the bow. The extraction sequence started with the diesel, followed by the fuel and lubricant. Oil booms were deployed around the shipwreck as a precaution in case of an oil spill.

However, the salvage team was forced to stop as the northeastern winter monsoon picked up and the water surface became rough on 23rd March. On the morning of 24th March, the rear section of the *T.S. Taipei* broke

Regulations and procedures

The governing basis for the management of ocean pollution in Taiwan is the "Marine Pollution Control Act" and the "Emergency response plan for major marine oil pollution".

Based on the (potential) amount of oil released, the oil spill response efforts may be categorized into three levels:
- Level 1 (<100 tonnes - minor spills),
- Level 2 (between 100 and 700 tonnes - medium spills)
- Level 3 (>700 tonnes - major spills).



Incident response process - Source: © Geographic Information Technology Co., Ltd.

When a ship-related major marine pollution incident occurs, the first priority is to establish a response center that incorporates the response teams of the government and ship owner. The government team consists of experts and personnel from EPA, MOTC, CGA, Council of Agriculture (COA), local governments, professional consultants and emergency response organizations entrusted by the government, and the ship owner's team includes members of the insurance company employed by the ship owner (e.g. P&I club), professional consultants (e.g. ITOPF) and the response execution organization. The levels of emergency efforts are determined based on where and to what extent the incident occurs, after the response center is established. The responsible government agency takes over the command, whereas others provide their assistance in the response effort.

In terms of the jobs to be performed by government agencies within the response organization, EPA is in charge of coastal pollution clean-up, CGA is in charge of offshore pollution clean-up, and MOTC Maritime and Port Bureau is in charge of the removal of onboard pollution as well as the cargo and shipwreck according to "Commercial Port Law".

The *T.S. Taipei* incident was a Level 2 oil spill in general waters. The regulation required EPA to assemble all related agencies and entities and establish the response center.

The entire incident can be separated into two stages: Stage 1 is the "marine pollution response" where EPA takes charge of the response center; and Stage 2 is the "shipwreck removal" where the MOTC Maritime and Port Bureau is the responsible agency.

Damaged ship hull

Overflight by the UAS

apart and listed 25 degrees towards starboard under the constant pounding of high winds and powerful swells. As the rear section broke away, 2 pieces of hatch covers, each weighing 30 tonnes, fell into the cargo holds, smashing several containers and cracking 2 fuel tanks that were yet to be extracted. As a result, further oil leakage was detected due to the damage to the fuel tank and hull, which in turn caused more pollution to the submerged containers on board and surrounding waters.

In this light, the response center was forced to reevaluate the response plan to reinforce the following response efforts.

The ship owner's response team boarded the ship again on 27th March as the seas calmed down. Oil booms were deployed on both sides of the break in the hull, the starboard side of the rear section and around the stern to contain any further oil spills, and fuel and oil tank extraction started again. At this time, the breached fuel tanks were filled with seawater and goods spilled from damaged containers. Manual labor was employed to remove the goods from the tanks before the fuel could be pumped, which added extra difficulty to the entire operation.

As the remaining fuel was extracted from the damaged fuel tanks, the next job in line was to extract the oil from the lubricant tank which was below the water line in the partially submerged engine room. In the process, the ventilation duct had to be sealed since the pressure prevented further extraction after 1 m^3 of oil was extracted.

The fuel and oil extraction came to an end on March 31. At this point, 41.9 m^3 of diesel, 295.1 m^3 of fuel and 1 m^3 of lubricant had been extracted. However, there were still 36 m^3 of lubricant sealed in the tank below the water line in the submerged engine room. This had to be dealt with in the subsequent stage of "shipwreck removal".

Fuel and oil extraction from the hull

Coastal clean-up

The coast of Shimen is rocky with small beaches dotted along the shoreline. At the beginning of the *T.S. Taipei* incident, the oil spilled was mainly the lubricant from the engine room. The response center dispatched the government's response team to initiate the cleaning task for the coastal oil pollution before the ship owner's team took over. Later, there was a large spill of fuel as the hull broke apart. The most polluted shores totalled around 2 km. There were oil stains on rock surfaces and crevices along the coastline, making it difficult for quick removal. At other areas, there were minor contaminations such as oil-containing garbage and tar balls.

As compensation for the economic losses caused by the incident to local residents and fishermen, they were hired and trained by the ship owner's coastal response team for the clean-up efforts. The coastal clean-up consisted of three stages. Stage 1 aimed to clean the pollution that would potentially move or further spread, including the coastal oil pollution that could be removed directly, garbage that was contaminated by oil spill and the tar balls on the beaches. Stage 2 was set to clean the oil on rocky surfaces using high-pressure

→

Shoreline cleanup

water jet, pebble surfaces using low-pressure water jet, and hard-to-clean oil pollution using high-temperature, high-pressure water jet. Stage 3 was targeted towards restoring the beaches to their original appearance by placing cleaned rocks and pebbles below the low-water line, thus allowing erosion by tidal differences and disintegration by microorganisms in order to remove the oil residue left on the rocks. From the onset of the incident on 10th March until the end of coastal cleaning on 11th May, 11,937 labor counts were dispatched to carry out clean-up operations and recovered 66,402 litres of oil from the shoreline and 128,039 kg of oil-contaminated garbage, helping restore the coasts of Shimen back to their previous state.

Ocean surface monitoring and oil spill clean-up

EPA introduced UAS, satellite and coastal radar to monitor the ocean surface around the incident site and to implement actions to prevent the oil from continuously spreading. CGA dispatched patrol boats to inspect these waters as well as assist in monitoring and cleaning. The response center, at the same time, requested that the ship owner's response team hire local fishing boats to assist in monitoring and cleaning. When oil slicks were spotted on the water surface, the hired boats were deployed to clean the spills by dragging absorbent cotton ropes and/or balls or using absorbent patches.

Removal of non-immerged containers

The container removal started on 1st April as the fuel and oil extraction from the ship hull came to an end. This work aimed to remove containers on deck and in the cargo holds that were not damaged by water. On the front deck, there were containers loaded with cargo, eight of which contained hazardous substances, while those on the rear deck were empty. The priority containers to be removed were those containing hazardous substances, followed by the heavy containers on the front deck, empty containers on the rear deck and those in the undamaged cargo holds.

The removal of the empty containers on the rear deck was difficult since the stern of the ship was listing 25 degrees toward the starboard side. The first requirement was to secure the 40" containers that were stacked 4-levels high. Once they were secured, the workers started to cut the fasteners that tied the lowest level of containers to the deck. The job required extreme caution as the misaligned containers were at risk of fall on the workers instantly at the moment when the fasteners were cut. All 198 containers were removed safely on 7th April.

Removal of residual fuel/oil and oil-soaked objects in the cargo holds

As the undamaged containers on deck and in the first cargo

Map of strandings on the coastline

Removal of upper deck containers

hold were removed, the attention shifted to clean the fuel and oil spilled into cargo hold #3 and the objects scattered and soaked in oily water. These objects from the damaged containers were mostly backpacks and long rolls of plastic fabrics. These plastic fabrics were entangled and soaked in oily water. The space-limiting conditions made manual cleaning very difficult, let alone the use of a skimmer. Therefore, professionals were sent down to the floor of the cargo hold to cut and fetch these oil-soaked objects out of the oily water before the following oil skimming and cleaning could be conducted. After most of the spilled oil and oil-soaked garbage had been removed, high-pressure water jet was used to remove the oil residues on the bulkhead and containers, and the stripped residues were removed using ropes, balls and patches of absorbents as well as saw dust. The cleaning of residual oil and oil-contaminated objects in the cargo holds was completed on 5th May.

Removal of residual oil in cargo holds

Rocky shores of Shimen

Completion of response to marine pollution

Once all the operations of fuel and oil extraction, removal of undamaged containers, removal of residual oil and oil-contaminated objects in cargo holds, cleaning of oil spills on water and coastal decontamination were completed, the response center, still under the command of EPA, came to the stage of the termination of marine pollution response action. With the field survey and witness accounts of entrusted third parties, scholars, experts, local residents, news media and the response center, the Executive Yuan approved the completion of the "response to marine pollution" for the *T.S. Taipei* on 11th May, and the MOTC Maritime and Port Bureau took over the response center and initiated the "shipwreck removal" on 12th May.

Shipwreck removal preparation

To remove the shipwreck as soon as possible and to prevent further impacts on the environment, the response center reached an agreement to remove the shipwreck by

→

having the shipwreck refloated and towed away from the site. The ship owner and its P&I club hired a professional crew for this removal task through open bidding, and the joint venture of the Singapore branch office of SMIT Salvage from the Netherlands and APHE won this competition. A fleet consisting of a 1,000-tonnes floating crane, a semi-submersible deck barge capable of carrying 23,000 tonnes and an 8,500-HP tug was dispatched from Singapore to Taiwan for the removal of the shipwreck.

On 16^{th} May when preparation was underway, the lasting wave of the strong northeastern winter monsoon delivered a gusty blow to the *T.S. Taipei* and the listing of the rear section aggravated to 32 degrees with an apparent risk of turnover. Based on the evaluation by the SMIT team, the response center agreed to remove the shipwreck in a stepwise sequence, including the lifting of hatch covers and soaked containers in the cargo holds, cutting off and lifting the living quarters and then engine, and refloating and removing the rear section followed by the front section.

As the summer approached, the northeastern winter monsoon subsided. However, there were typhoons from time to time.

Removal of submerged containers

The response team started lifting all the hatch covers on 25^{th} May. With the confirmation of hull stability, the soaked containers in the cargo holds were lifted out one by one to allow the water to drain before placing the lifted containers onto the deck barge. Oil absorbent materials, such as absorbent ropes and fabrics, were used throughout the draining and lifting process to prevent residual fuel and oil from contaminating the surrounding waters.

Lifting of submerged containers

The rear section with a 32-degree list

All soaked containers were removed successfully by 10^{th} June.

Removal of the living quarters

The salvage team started to remove the on-board living quarters, weighing approximately 650 tonnes, on 11^{th} June in order to stabilize the rear section by reducing the weight for the following refloating and tow-away. The separation was performed with torches and chains. Before cutting, all flammable materials were removed. Once preparations were complete, cutting started on 19^{th} June. After experiencing several chain-breaking incidents, the living quarters were separated successfully and lifted from the shipwreck on 22^{nd} June and placed on the semi-submersible deck barge the following day.

Removal of living quarters

Removal of the engine

With the living quarters being removed, the removal of 450-tonnes engine started on 23^{rd} June. During this phase, much of the work, which involved stopping leaks, cutting, pumping and securing the sling, was done in an oily water environment due to the significant damage to the engine room. The team lifted the engine off the shipwreck on 1^{st} July and the engine was loaded on the deck barge on the next day.

Removal of the engine

Removal of the rear section

The removal of the rear section of the shipwreck commenced on 2^{nd} July after the engine was removed. The process involved refloating and tow-away at the grounding site and loading on the deck barge. This was the most difficult part of the entire removal of the *T.S. Taipei*. The rear section of the shipwreck still weighed nearly 3,000 tonnes

The rear section of shipwreck was refloated, towed away and loaded on the semi-submersible deck barge

even with the living quarters and engine removed, greatly exceeding what the 1,000 -tons floating crane could handle. The water pumping was a continuous effort on the rear section as the structure was massively damaged and the leaks were almost impossible to stop. However, the team managed to have the section lifted and towed away from the site using the floating force during the high tides on 22nd July. With the floating crane lifting the stern and leaks roughly stopped, the salvage team started to refloat and tow the section away with 2 tugs during high tides. As the process went on, the hull was breached again and taking on water, and the bottom became jammed on the rocks, not to mention a few snapped cables on the tugs. Despite the odds against the operation, the team managed to tow the rear section off where it was aground on 25th July and loaded the section on the deck barge on 27th July. The damaged and rugged bottom of the shipwreck made it difficult to secure it to the barge deck. However, the salvage team secured the wreck on the deck on 31st July using wood/blocks as auxiliary supports. On 1st August, this part of the shipwreck was hauled away from Shimen to Keelung Harbor for disassembling.

The front section of the shipwreck was refloated and towed to Keelung Harbor

Removal of the front section

Once the rear section of the shipwreck had been removed, the attention shifted to the removal of the front section starting on 2nd August. As the front section still remained water-tight, it was easily towed away from the grounding site after a few days of pumping, on the evening of 7th August. On 8th August, the front section arrived at a dock in Keelung Harbor ready for disassembling. Once the shipwreck had been removed, the cleanup of debris on the sea floor began. On 15th August, the entire response operation to the *T.S. Taipei* incident was officially over.

Conclusion

The work continued as EPA and New Taipei City Government consistently patrolled the surrounding waters and cleaned the beaches. The coastal waters of Shimen gradually regained their original clean beauty after all these efforts. The response operation of the *T.S. Taipei* took more than 5 months from 10th March when the incident happened to 15th August at the end of the response efforts. Despite many setbacks and difficulties such as the strong northeastern winter monsoon and typhoons, the government agencies, civilian experts and consultants, the ship owner and the response and salvage teams worked together and brought in the marine pollution response resources in Taiwan and around the world to prevent further spreading of pollution and remove the pollution and shipwreck quickly. The team work and the hard labors to protect and to restore the genuineness of the aquatic environment of Shimen have marked a new page in Taiwan's history of marine pollution response.

Yung-Kai Kuan, GI-Tech Co., Ltd.
Chihhao Fan, National Taiwan University
Jiunn-Horng Yeh, EPA, Taiwan (R.O.C.)

Coast of Shimen back to its beauty after the response efforts

STUDIES

© Philippe Cuny, MIO

PRISME project: Fate and impact of oil in the mangroves of French Guiana

Within the scope of our activities geared towards enhancing our knowledge of the behaviour and impact of oil in the environment, Cedre joined a consortium composed of French academic teams (Mediterranean Institute of Oceanology, European Institute for Marine Studies, University of Pau and Pays de l'Adour, University of Toulouse) to work on the response of a sensitive environment, the mangroves of French Guiana, to oil pollution.

Context

The PRISME project, coordinated by the Mediterranean Institute of Oceanology (University of Aix-Marseille), was funded by the French National Center for Scientific Research (CNRS) and the Institute of Research for Development (IRD) under a programme of "Primary Support Exploratory Projects" led by the Institute of Ecology and Environment (INEE). The project began in October 2015 and was completed in 2016. The PRISME project on the fate of oil contamination in the sediments of Guiana's mangroves focused both on the structure of communities (biodiversity of the micro and macrobenthos) and on its functional aspects (biodegradation of oil, bioturbation). During this project, an experiment was conducted in the natural environment over a period of one month. This issue has been a hot topic since the emergence of oil spill response and has been the constant focus of ongoing research. The TROPICS experiment, which began in 1984 in Panama and in which Cedre took part in 2016, is the most prominent example.

Experiments conducted

The study involved the incubation of core samples of sediment 30 cm long and 10 cm wide, some of which were contaminated with oil (HC+) and others not (HC-). For the oil-contaminated samples, 20,000 ppm of Brazilian oil was added to the surface sediment layer (top 2 cm). After 4 weeks of exposure, the core samples were recovered and cut into 1 cm thick horizons which were used to:

- Determine the concentration of residual oil and the degree of biodegradation,

- Quantify the sediment turnover due to the action of macroorganisms by determining the vertical distribution of inert tracers in the form of fluorescent microspheres introduced at the surface at the beginning of the incubation period,
- Characterise the macrobenthic community (diversity, density, vertical distribution),
- Characterise the structure of the bacterial communities (density, diversity).

In total, nearly 200 subsamples of sediment were prepared and stored in liquid nitrogen, dry ice, a coolbox or fixed with formaldehyde depending on the tests to be carried out: chemistry, microbiology, meiofauna (organisms between 0.1 mm and 1 mm in size) and macrofauna.

Results obtained

The total petroleum hydrocarbons (TPH) were quantified in the different sediment horizons of the HC+ and HC- core samples. At the experiment start point, the uncontaminated and contaminated sediment mixtures showed oil concentrations of 0.7 ± 0.3 mg/g of dry sediment (hydrocarbons of biogenic origin) and 23.3 ± 2.8 mg/g of dry sediment, respectively. After one month of in situ incubation, the TPH measurements in the contaminated cores showed an overall reduction rate of around 20 % for the whole of the core. A sharp drop in TPH concentrations was recorded in the 0-2 cm surface horizon. Approximately 59 % of the hydrocarbons had disappeared from the 0-2 cm horizon after the one-month incubation period. Around 35 % of the TPH initially introduced had travelled down to the 2-4 cm horizon and 6 % were found in the 4-6 cm and > 6 cm horizons (Fig. 1).

More detailed chemical analysis of the concentrations of alkanes and aromatic compounds showed a high level of degradation, reaching 90 % after only 4 weeks of exposure. This degradation level was achieved due to the presence in the sediment of hydrocarbon-adapted bacterial communities which was also confirmed by the microbiological analyses. These bacteria, known as hydrocarbonoclastic due to their capacity to break down hydrocarbons for their development, are therefore naturally present in this type of environment, which explains the level of biodegradation obtained.

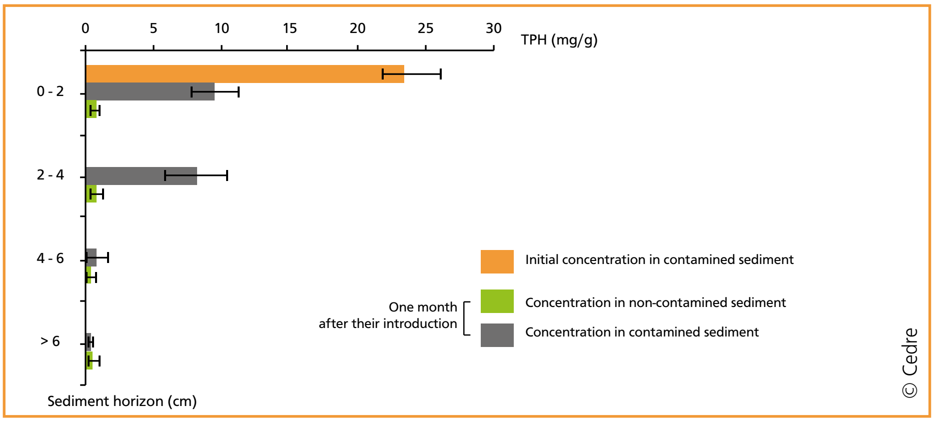


Fig. 1 - Total petroleum hydrocarbons (TPH) measurements in the sediment by depth

The PRISME project revealed a high impact of the presence of oil on the macrobenthic community. A mortality rate close to 90 % was recorded in the top two sediment horizons (Fig. 2).

Although the species richness remained unchanged (10 ± 5 species), the community composition changed considerably and could have a major impact on the functioning of the ecosystem. The disappearance of certain families of organisms may have had a negative effect on the level of bioturbation, which is essential for sediment turnover, sediment biogeochemistry and therefore ecosystem functioning. Furthermore, we were able to demonstrate the presence of a high number of insect larvae at the surface of the contaminated cores, due to the disappearance of predators. In the event of a real spill, there may be a risk of insect proliferation during the months following the spill.

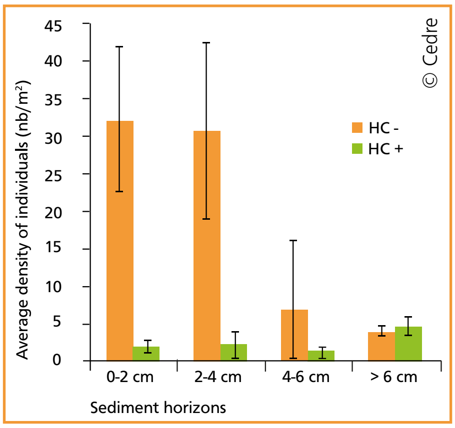


Fig. 2 - Average density of individuals (nb/m²) of meso- (>250 µm) and macro-organisms (> 1 mm) for each sediment horizon (0-2 cm; 2-4 cm; 4-6 cm; > 6 cm) for the "uncontaminated" (HC-) and "contaminated" (HC+) conditions

Future prospects

The PRISME project, which ended in September 2016, has given and will give rise to a number of publications and presentations on the national scene (PEPS Mangrove projects seminar in Marseille in 2016, Francophone Association for Microbial Ecology seminar in Brest in 2017) and international scene (AMOP in Halifax in 2016, IOSC in Los Angeles in 2017). All the partners have chosen to pursue their collaboration by developing a sequel which is currently awaiting funding. The aim of this future, wider-reaching project will be to assess the long term fate and impact of oil in the mangrove as well as to study the behaviour of an oil slick in "liquid mud" before it consolidates. This environment, which is typical of the coast of French Guiana under the influence of the Amazon, is characterised by a very high concentration of fine particle sediment and shifting mud banks along the coastline. To our knowledge, no studies have yet been conducted on the behaviour of oil in this type of environment. This raises the question of how an oil slick will behave: will it sink or disperse naturally in the mud, contaminating the whole water column? These questions provide a starting point for the future project dubbed GANESH.

Ronan Jézéquel, Cedre

Review of 16 years of pollution reports

In France, pollution observations are mainly the result of surveillance from French Customs' planes, although they can also be made from civil and military planes and vessels or from the shore (semaphore towers, ports, fire brigades, military police). The data gathered is recorded in official reports known POLREPs (POLlution REPorts), drawn up by the different Maritime Rescue Coordination Centres (MRCCs).

Introduction

In September 1998, at the request of the French General Secretariat of the Sea, Cedre produced an annual report of maritime pollution incidents in the waters under French jurisdiction. Since then, POLREPs have been systematically brought to the attention of Cedre which developed a database in 2000 to facilitate their collection and exploitation. Although annual studies have been conducted, the database had thus far never been the focus of a comprehensive statistical analysis. This article presents of a few extracts of this study. Only confirmed POLREPs have been taken into consideration, i.e. detections reported by an accredited agent.

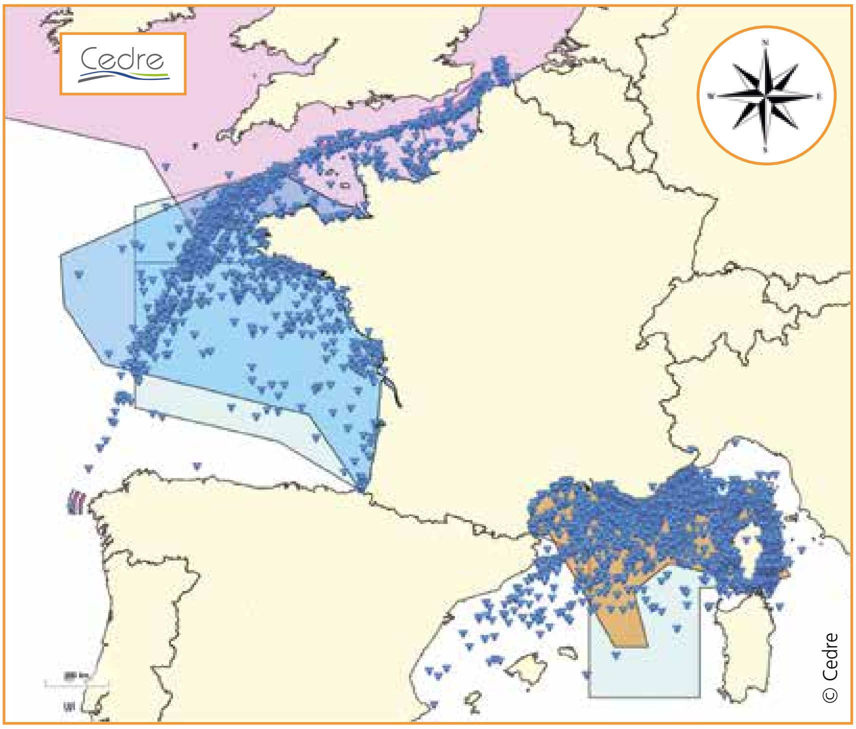
Mapping 16 years of POLREPs

The study of the POLREPs recorded from 2000 to 2015 confirms that the main areas where releases occur are along the major shipping routes: Ushant and Casquets traffic separation schemes and the routes Marseille-Corsica, Genoa-Barcelona, Genoa-Valencia, Genoa-Strait of Messina via the Corsica Channel and Genoa-Marseille.

Key

Confirmed POLREPs

Administrative boundaries
Ecological Protection Zone
Exclusive Economic Zone
Special Area
Traffic Separation Scheme
Surveillance Area (MRCC)



Location of confirmed POLREPs from 2000 to 2015 in mainland France

Type of pollutant by geographical area

By studying different types of pollutant by geographical area, we learn that 80 % of confirmed chemical spills occur in the Mediterranean Sea, as do 83% of pollution incidents involving household waste, 71 % of those involving plant debris, 84 % of vegetable oil spills and 54 % of confirmed oil spills. Overall, 65 % of POLREPs in France concern the Mediterranean Sea.

This study also revealed that 42.9 % of container losses were reported in the Western Channel (of the 15 % of confirmed POLREPs located in the Western Channel). Even although the source is not provided for any of them, we can easily suppose that they may have been lost by container ships sailing to the major commercial ports of Northern Europe, such as Amsterdam, Rotterdam or Le Havre.

Analysis according to sea state

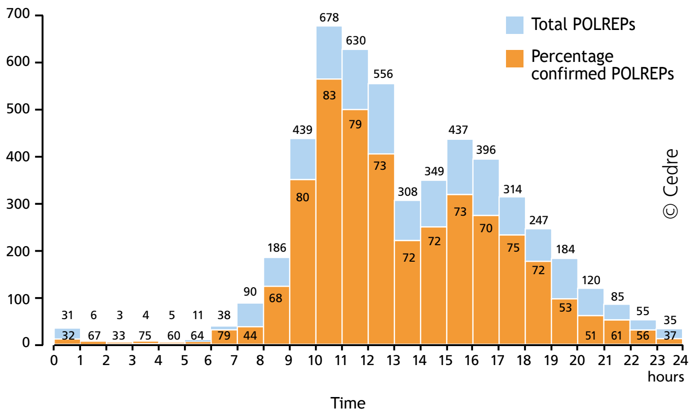
Sea surface agitation due to the wind force is a key criterion in the reliability of POLREPs. The calmer the sea, the easier it is to detect pollution. The graph below presents the POLREP confirmation rate according to the sea state, based on the Beaufort scale. This scale ranges from 0 to 12, with 0 being a calm sea and 12 a hurricane. The share of confirmed POLREPs decreases as we move up the Beaufort scale.

However what is most evident from the figure below is the decrease in the total number of POLREPs issued as the Beaufort scale value increases. There is therefore not enough data for high wind force values to draw any conclusions on the confirmation rate in rough seas. Various hypotheses may be put forward to explain this decrease in the number of POLREPs. The most plausible are as follows:

- when the sea is rough, there are just as many pollution incidents and just as much surveillance as in calm conditions, but the pollution is not as visible,
- when the sea is rough, there are fewer vessels at sea, therefore fewer potential polluters but also fewer observers.

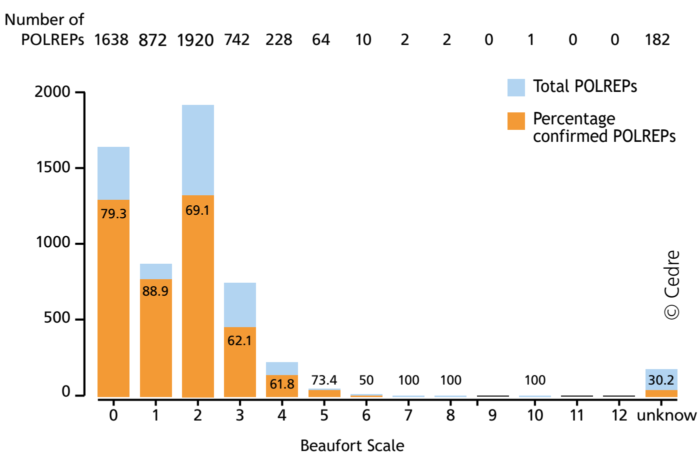
Distribution by time of detection and season

At night, it is difficult to detect pollution and this exacerbates the risk of confusion with natural phenomena. Our statistical analysis comprises both total POLREPs and confirmed POLREPs by time of detection. It only includes POLREPs for mainland France and for which the time of detection is provided. A share of the POLREPs issued at night are based on satellite observations provided by the European Maritime Safety Agency (EMSA), some of which were subsequently confirmed by further observation. The results obtained naturally depend on the quality of the data provided and the surveillance strategies implemented by the authorities in charge of aerial observation.

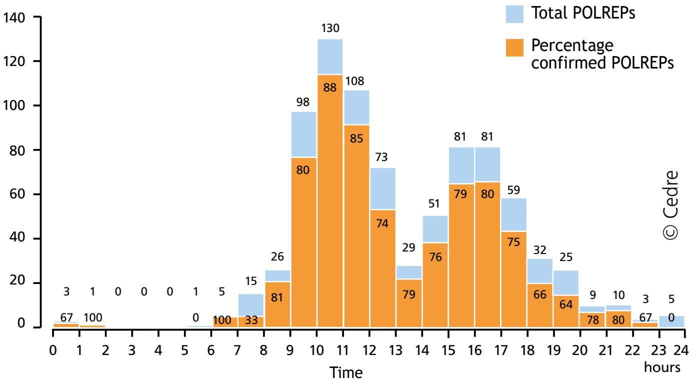


Number of POLREPs and confirmation rate by time of detection, from 2000 to 2015, in mainland France

To take this investigation further, we conducted the same analysis again, this time taking into account the season, to attempt to pinpoint any differences in detection trends between summer and winter, due in part to the numbers of daylight hours. A slight difference is clearly visible in the early morning for summer and spring POLREPs, perhaps due to discharges released during the night.



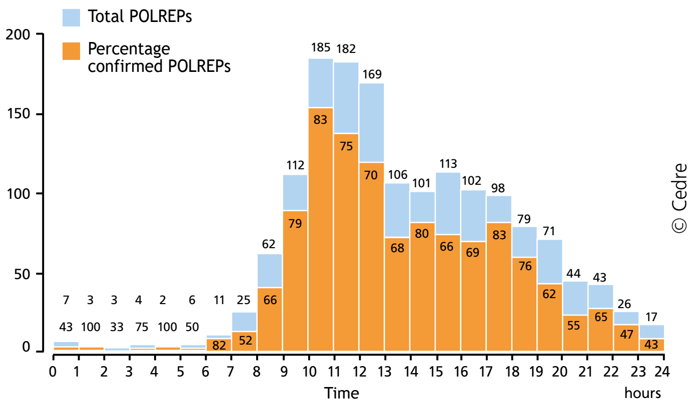
Issue of POLREPs and confirmation rate according to sea state, from 2000 to 2015



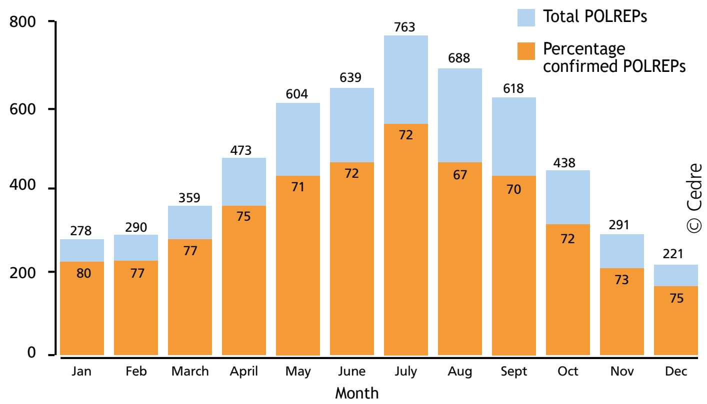
Number of POLREPs and confirmation rate by season, from 2000 to 2015, in mainland France - January to March

→

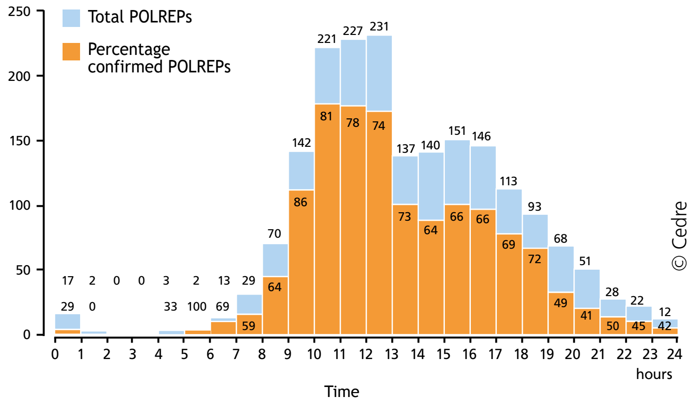
16 years of POLREPs



Number of POLREPs and confirmation rate by season, from 2000 to 2015, in mainland France - April to June



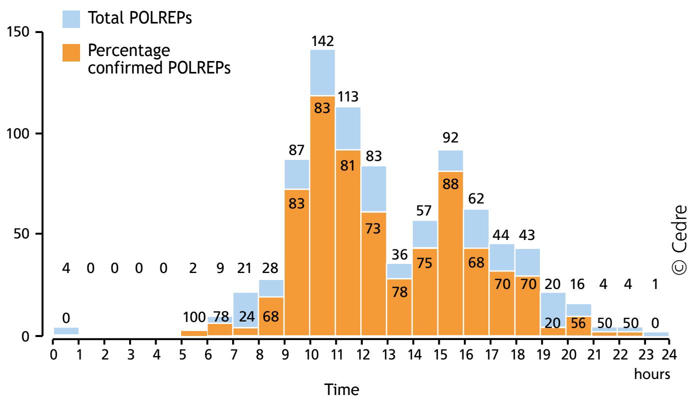
Number of POLREPs issued and confirmed by month from 2000 to 2015



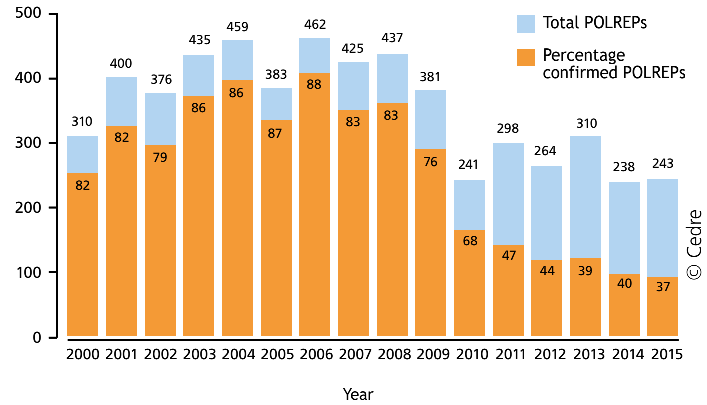
Number of POLREPs and confirmation rate by season, from 2000 to 2015, in mainland France - July to September

Conclusion

From 2010, the number of POLREPs issued and the share of confirmed POLREPs dropped sharply. Although various factors may be responsible for this slump, it is undoubtedly proof that the repression of illegal discharge is effective. The entry into force in 2009 of the French law on environmental liability, which notably introduced heavier fines for polluters (up to €15 million), contributed to this decline. This trend is also observed by the wildlife centres which collect and care for oiled birds.



Number of POLREPs and confirmation rate by season, from 2000 to 2015, in mainland France - October to December



Number of POLREPs issued and confirmed by month from 2000 to 2015

The number of detections is higher in the summer, possibly due to an influx of pleasure boaters, and therefore of polluters and potential observers. This hypothesis is supported by the fact that, from May to September, 58.3 % of the total number of detections are located in the Mediterranean, a popular tourist region, compared to 50.2 % the rest of the year. The conditions are also favourable to observation thanks to more hours of sunlight and a milder climate. The confirmation rate dips slightly in the summer months, probably due to an increased number of pollution alerts by non-specialist holidaymakers and also due to more natural phenomena such as algal blooms, which may lead to confusion.

Vincent Gouriou and Charlène Wojerz, Cedre

© Cedre

MARPOCS in a nutshell

> Experimentation
> Modelling
> Training

Context

Funded by the European Union's civil protection mechanism (DG ECHO) for a two-year period, the MARPOCS project aims to develop and implement an integrated operational framework for preparedness and response to oil and HNS spills in marine waters. It concerns the Atlantic subregion encompassing Morocco, Madeira and the Canary Islands, under the Lisbon Agreement.

Coordinated by IST (*Instituto Superior Technico*) in Portugal, this project also involves: Action Modulers (*Consultoria de Segurança*), ARDITI-OOM (*Agência Regional para o Desenvolvimento da Investigaçao Technologia e Inovaçao - Observatorio Oceânico da Madeira*), Cedre, INRH (*Institut National marocain de Recherche Halieutique*), PLOCAN (*Plataforma Oceanica de Canarias*) and UPLGC (*Universidad de Las Palmas de Gran Canaria*).

Here's a glimpse of the latest project highlights...

Laboratory-based experimentation and training

Over recent months, Cedre has conducted experiments at its facilities to characterise the behaviour of several chemicals according to different controlled environmental parameters. The results obtained will significantly contribute to the development and configuration of a modelling software programme designed to simulate the fate of an HNS spilt in the environment.

Cedre is also in charge of coming up with new training sessions and exercises on oil and chemical spill response tailored to the region concerned by the project.

In December 2016 and March 2017, two groups of Moroccan civil protection officers were trained at Cedre. This was the opportunity for Cedre's teams to gain insight into the needs of the national authorities in this field.

Field data collection

The calibration and validation of operational metocean and transport modelling systems were improved by collecting specific physical data. Data was collected from several sites off the Canary Islands and Madeira, by PLOCAN and ARDITI-OOM respectively. The currents, temperature and salinity were selected as key parameters to be measured and integrated in the software.

Latest partners meetings

The 4th project coordination meeting was held on 10th and 11th July 2017 in Madeira (Portugal). The 3rd technical meeting was held in Casablanca (Morocco), from 1st to 3rd March 2017. It included a workshop and a one-day training session. The workshop focus was on Morocco's marine pollution preparedness and response capacity. The training session aimed to help the personnel involved in emergency response to oil or chemical spills by providing them with practical training and advice for handling such incidents.

Stéphane Le Floch, Cedre

HNS-MS
Improving
EU Member States' preparedness to face
HNS pollution
by developing a decision-support tool

Funded by the Directorate-General for European Civil Protection and Humanitarian Aid Operations (DG ECHO), the HNS-MS project on Improving Member States Preparedness to face an HNS Pollution of the Marine System was launched in 2015 and aimed to develop a prototype decision-support system. This system will ultimately be made available to and activated by the authorities in charge of response at sea (coastguards, maritime authorities).

{HNS-MS} project aims

The HNS-MS project is now complete. The system developed is operational and will be available via a web platform by the end of 2017. This system can be used both to predict the drift and behaviour of a chemical spilt at sea, and to improve the understanding and evaluation of the situation in terms of safety, human health and potential impacts on the environment and socio-economic activities.

The Bonn Agreement

The Bonn Agreement is the mechanism by which the North Sea States and the European Union work together in the North Sea Area to:

- help each other in combating pollution from maritime disasters and chronic pollution from ships and offshore installations
- carry out surveillance as an aid to detecting and combating pollution at sea.

The contracting parties are Belgium, Denmark, France, Germany, Ireland, the Netherlands, Norway, Sweden, and the United Kingdom of Great Britain and Northern Ireland.

The demonstrator was designed to cover a geographical area encompassing the Bonn Agreement Area (Northern Europe) and the Bay of Biscay, two maritime areas across which a wide variety and large quantities of chemicals are transported. Furthermore, it was designed with a view to subsequently being extended to other European maritime regions.

A multidisciplinary consortium

The project was led by the Royal Belgian Institute of Natural Sciences (RBINS) which is involved at a national level in the decision-making process and spill response. The consortium included a member of a maritime authority, represented by the DG Environment of the Belgian Federal Public Service for Public Health and the Environment, the research departments and chemistry and experimentation laboratories of Cedre and the *Ecole des Mines d'Alès* (ARMINES) and research organisations specialised in spill modelling (ALYOTECH, ARMINES, RBINS). Cedre was also in charge of the environmental vulnerability atlases.

An interesting challenge

One of the project's challenges was to improve knowledge of substances' fate in the environment and in particular to precisely identify the compartments potentially affected (atmosphere, surface, water column or seabed) in order to more accurately determine the immediate risks for responders, to guide response strategies and to predict the impact of the chemical on the environment and on human activities (fishing, tourism, leisure, etc.).

From experimentation to modelling

Around twenty chemicals were characterised in the laboratory (density, viscosity, surface tension, evaporation, dissolution rate and limit) in different trial conditions in order to determine their fate in different types of environments in terms of their salinity and temperature.

In addition, tests were performed on 10 products using Cedre's chemical test bench (Fig. 2) to measure the product's persistence at the water surface and the competition between the evaporation and dissolution rates (Fig. 1) in controlled environmental conditions (wind speed, temperature).

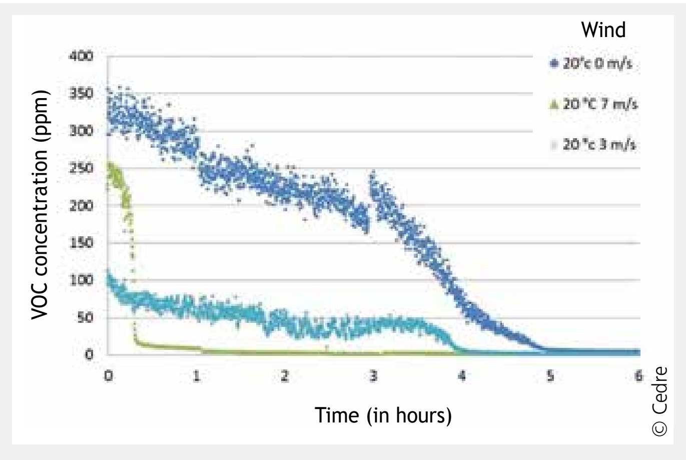


Fig. 1 - Evolution in n-butyl acrylate concentrations above the water surface measured at 3 wind speeds

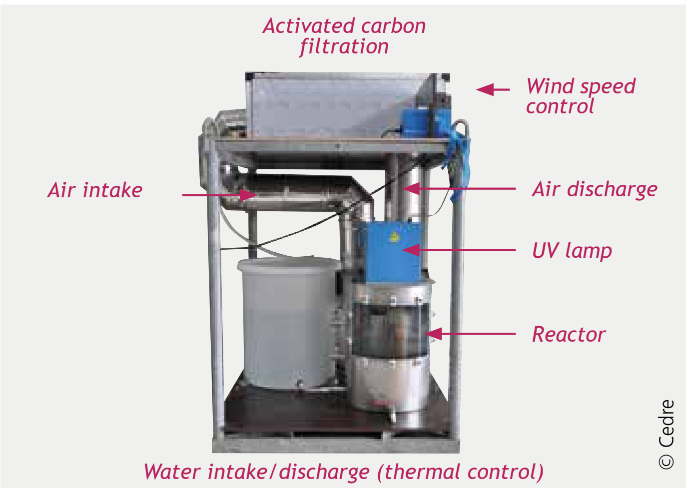
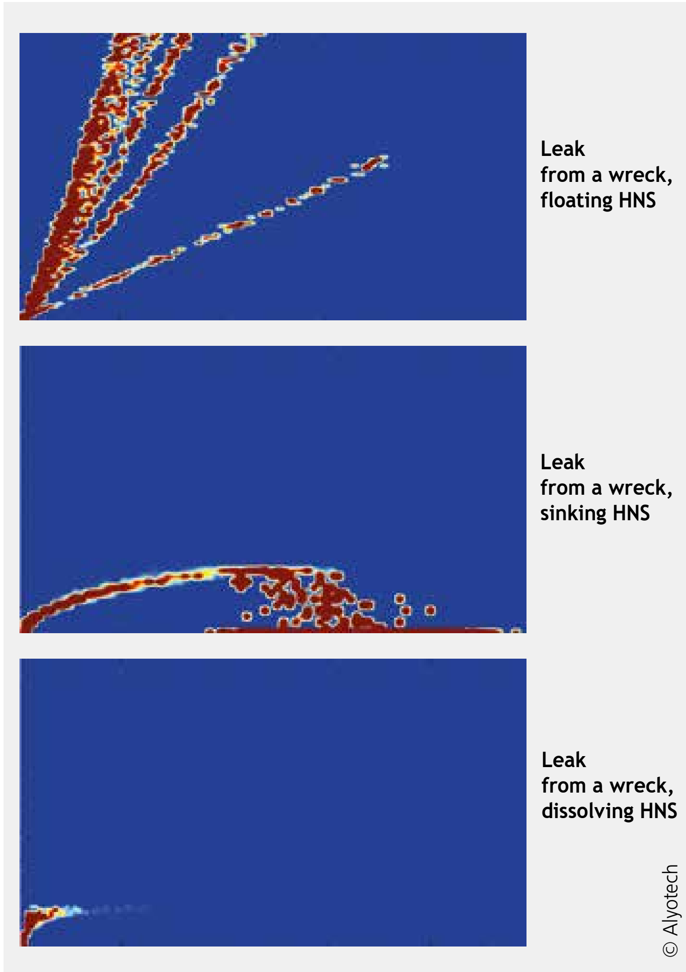


Fig. 2 - Cedre's chemical test bench

The results of these trials were entered into the chemical database specially developed during the HNS-MS project and which can be directly accessed via the project's web platform.

In addition to these trials, the experimentation columns at Cedre and the *Ecole des Mines d'Alès* were used to characterise the dissolution process of a chemical released from a sunken wreck.



Concentration profiles in the water column (ChemSPELL model and NASA GISS Panoply viewing tools)

All the experimental results obtained were used to calibrate and validate the chemical fate modelling systems. A 3D mathematical modelling system was developed for several leak scenarios (surface vessel, pipeline, wreck, etc.).

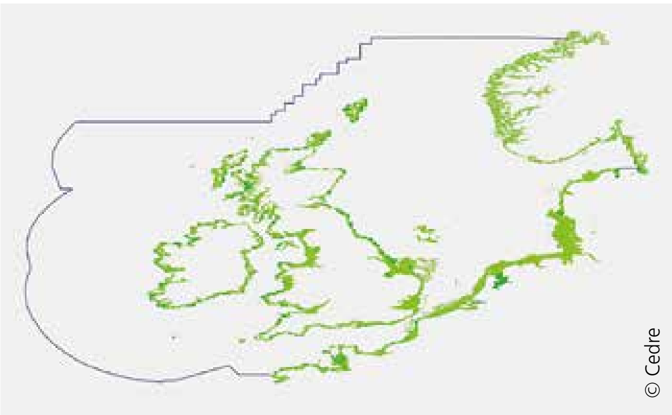
Three models were developed in order to accurately forecast the behaviour of the product immediately after the spill, longer term (1 day to 1 week) and further from the leak point, as well as its dispersion in the atmosphere.

Within the context of this project, the aim was to provide users with a set of keys to interpret the results, unlike the "black boxes" of commercial models, by giving access to the modules and algorithms used as well as the properties of the chemicals used for the simulations.

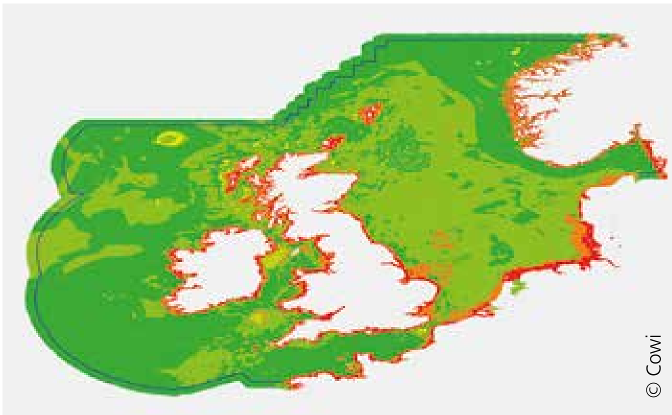
An atlas comprising 72 vulnerability maps

In order to help users assess the potential impacts on the environment and on socio-economic activities, vulnerability maps will be accessible via the web platform. These GIS-based maps were developed by Cedre using the maps produced through the European project BE AWARE (Bonn Agreement: Area-Wide Assessment of Risk Evaluation, jointly funded by DG ECHO) on oil pollution, adapting them to the specificities of chemicals. The vulnerability was evaluated by season and by category (species, habitats, socio-economic activities and protected areas) based on 4 main types of chemical behaviour (floating, sinking, dissolving and evaporating). This gave a total of 64 situations to be studied.

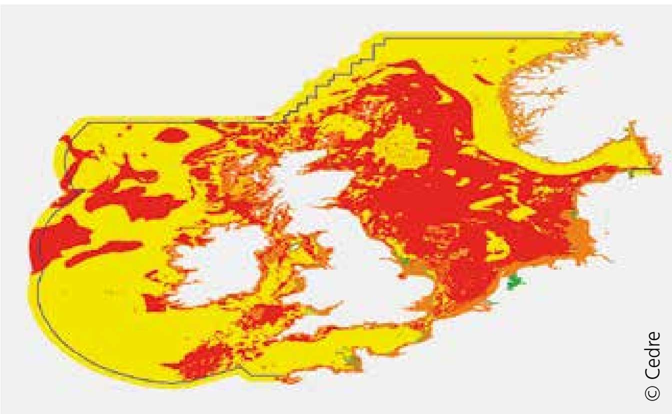
While the vulnerability maps cover the whole of the Bonn Agreement area, operational-scale maps were developed for the Belgian coastline and are able to be directly used by the authorities. In total, the atlas developed comprises 72 digital maps.



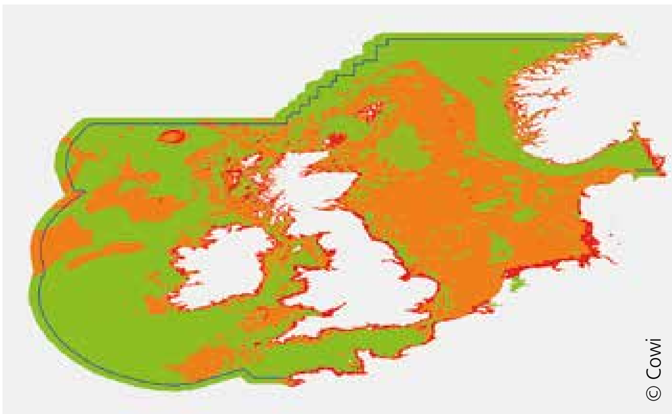
Habitats, pollutant in the air, spring



Habitats, pollutant at the surface, spring



Habitats, pollutant on the seabed, spring



Habitats, pollutant in the water column, spring

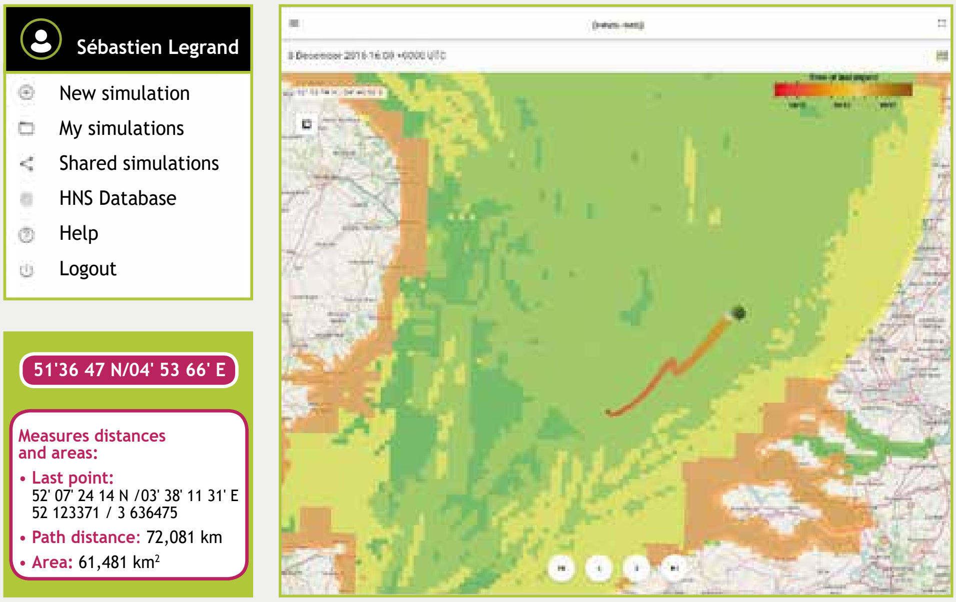
Vulnerability of habitats in the spring by affected compartment

Conclusion and perspectives

The technical reports on the different project tasks will be available via the project website (www.hns-ms.eu). The modelling system and web interface will be accessible to the authorities in the coming months. The project partners are currently working to disseminate the results obtained and the system developed. These outcomes will be presented to European delegates at the next meeting of the Bonn Agreement Working Group on Operational, Technical and Scientific Questions Concerning Counter-Pollution Activities (OTSOPA).

This project made significant headway in the different areas studied, however the partners have already identified some essential future developments: further experiments on chemicals, additional input to the database developed and already used in other European projects such as MARPOCS and MARINER, expansion of the processes handled by the models (chemical reactivity, fire and explosion risks), extension of the geographical area covered by the models and vulnerability maps and of course long term maintenance of the system developed.

Florence Poncet, Cedre



© RBINS

The decision-support system accessible via the web platform allows drift predictions and vulnerability maps to be overlaid to better assess the potential impact of a spill. Example showing the Belgian coastline

© Cedre

© Cedre

© Cedre

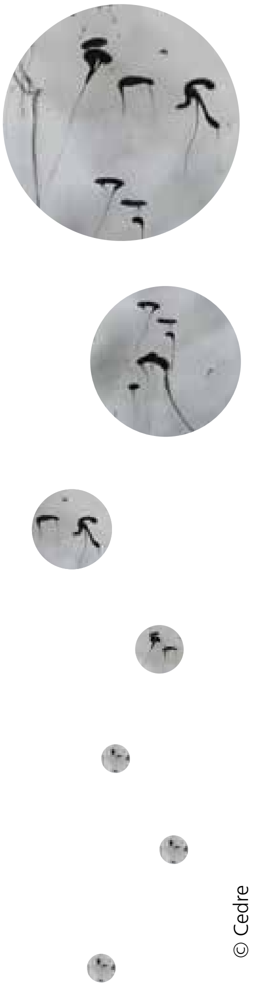
© Cedre

Beach on the Belgian coastline

New facilities

The C³ is here!

But what on earth is it??? The C³ is an innovative experimentation device designed to place a fluid particle in suspension in a liquid environment using a countercurrent. The concept was invented by the *Ecole des Mines d'Alès* and Cedre as part of the Blow Out 2 project and the CounterCurrent Column (C³) was designed and built by Ylec Consultants. This system is set to be used to study the dispersion and dissolution of oils, chemicals and gases, in order to characterise their fate as they rise through the water column in the event of an accidental subsea release. This information is essential for responding as efficiently as possible to subsea spills and mitigating their impact on the aquatic environment.



Studying chemical dispersion of oil in the countercurrent column

A new vehicle storehouse

For several years, the need for a new storage area for vehicles has been apparent. The response equipment showroom intended for training purposes was congested due to the presence of certain equipment which did not belong there. Therefore, in 2016, Cedre had a 300 m² shed built, permanently freeing up the space required in the showroom for practical training.

Cedre's storehouse under construction

This simplistically designed outbuilding has a glued laminated timber structure and was chosen as the most cost-effective solution. It is built on large concrete slabs connected by horizontal beams. The structure's dimensions were determined in order to suit the relatively heterogeneous ground in this polder. The forward and rear walls are covered with rot-proof wooden cladding and the two end walls are composed of polycarbonate panels offering natural light. The floor is a single layer of bitumen similar to that used for road surfaces. It has 5 large sectional doors facilitating access to each of the stored vehicles.

Cedre's storehouse completed

New recruits

Romain Kervern

After an undergraduate degree in science and a first year studying computer programming at the University Institute of Technology in Lannion, Romain opted for a diploma in accounting and management which he obtained in 2012. He began his career in the banking sector, where he took on a series of contracts working on domestic and international transfers, trading and life insurance. He then spent some time in Australia, before returning to France where he was recruited by *MSA d'Armorique* in 2015 in the payroll department. It was thanks to this rich professional experience that he was offered at job at Cedre in December 2016. He is in charge of management control – in particular with the analytical monitoring of contracts and personnel time recording management – and accounts payable.

Romain Dietschi

In 2012, Romain passed a competitive engineering school entrance exam and was accepted at the *Ecole des mines d'Alès* where he studied industrial risk management and crisis management. Through various work placements both in France and abroad, he addressed a range of issues: analogical modelling of volcanic mudflows, risk quantification for offshore exploitation and methane carriers. To complete his studies, Romain decided to pursue a Masters in naval and offshore architecture at ENSTA Bretagne. He carried out his final work placement at DNCS where he worked on a ship maintenance programming system. In October 2016, he was recruited by Cedre as a Studies and Training Department engineer.

Vassilis Tsigourakos

In 2009, Vassilis graduated from the University of Paris II with a Master I in European Law, followed by a Master II in Environmental and Maritime Law from Nice in 2010. After taking an additional Master II in integrated coastline and ecosystem management, he landed a first contract with the Permanent Secretariat of the ACCOBAMS Agreement (Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area) where he set up an interactive GIS database intended for the States' focal points and scientists. To serve his Greek military service, Vassilis then worked as assistant to the head of the international relations and geopolitical office of the Hellenic Navy Hydrographic Service. From 2014 to 2016, he worked for REMPEITC-Caribe where he focused on different issues relating to the OPRC and MARPOL Conventions, as well as on ballast water management. In September 2016, he joined Cedre's Studies and Training Department.

In-house promotions

Anne Le Roux

After graduating as an agronomic engineer with a specialisation in halieutics, Anne was recruited by Cedre in 1995 as a member of the Training Department. From 1999 to 2009, she also served as a duty officer. Over the years, she has become recognised as the key reference person for aerial observation and wildlife. In 2016, she was appointed Response Coordinator. Not long after she took on this role, she earned her stripes following the pipeline leak in Sainte-Anne-sur-Brivet, and later in the pollution caused by episodes of flooding in Ile-de-France. For the past three years, Anne has also been a technical advisor for the French delegation of the European Maritime Safety Agency (EMSA) and the Bonn Agreement OTSOPA Working Group.

Annick Penduff

With a technical diploma in accounting to her name, Annick embarked on a series of contracts in various sectors: automotive industry, metallurgy, hotel trade... In 2002, she was recruited by Cedre as an administrative and accounting assistant. She was quick to be promoted to a management assistant position where she was tasked with the analytical monitoring of contracts and managing field missions, as well as significantly contributing to the deployment of the ISO 9001 standard. In 2008, her responsibilities were extended with the reinforcement of management control and the development of human resource aspects. In 2017, Annick was appointed chief accountant. She is in charge of accounts receivable and accounts payable, the financial and training report, the research tax credit, the payroll, payroll and tax declarations and annual leave management.

New horizons...

Claudine LE MUT-TIERCELIN

As a doctor in marine geology and an engineer in oil exploration, Claudine worked for 8 years as a geological engineer at ELF Aquitaine Company, with various responsibilities in onshore and offshore oil exploration, in France and Africa.

She joined Cedre in 1989, as a member of the Information-Documentation Department, to produce a series of chemical response guides. After this initial project, she worked for 2 years as Deputy Training Manager, helping to organise national and international training courses.

From 1993 to 2002, she came under the auspices of the Emergency Response Department and was involved in many call-outs across France for the French authorities and the private sector, as well as abroad as part of the EU Task Force or at the request of the International Maritime Organization. In between times, she was also tasked with producing various contingency plans.

In September 2002, Claudine was placed in charge of Cedre's Caribbean Delegation where she assisted the authorities for the French Antilles and Guiana. She was awarded the title of Knight of the Order of Maritime Merit in 2011 in recognition of her work in this region.

We wish a happy retirement to our very own "Miss Caribbean" in her Breton homeland.

Xavier KREMER

Recruited by Cedre in 1991 for his dual experience in navigation and in the oil industry, Xavier is a Merchant Navy Officer with twelve years' experience in long-haul sailing followed by a position as safety and environment manager in an oil refinery.

Head of Cedre's Training Department until 2001, Xavier organised many courses for a wide variety of participants.

Meanwhile, he also conducted safety and environment audits as well as developing studies and contingency plans in the field of spill response for many industrial sites and overseas authorities. He was also involved in the response to numerous spills across the globe.

After serving as Cedre's Delegate for the Caribbean from 1st September 2001 until summer 2002, he then joined the Emergency Response team. He was also a project leader in his field of expertise.

In 2013, he was appointed as Cedre's Mediterranean Correspondent.

As a high-level sportsman, his heart now beats for his family and hobbies alone.

Georges PEIGNÉ

As a marine engineer, Georges joined Cedre in 1980 after working for three years in the maritime sector, with a particular focus on the development of the ports of Gabon and oceanographic research in France.

Through the successive positions he held at Cedre, he continued to be responsible for assessing, testing and validating response equipment, in particular that designed for offshore response or for containment, recovery and clean-up in inshore waters and on the shoreline. He was in fact involved in designing and developing many response techniques and equipment, now commonly used across the globe.

Personally involved as an adviser in all the major incidents to which Cedre was called out, he also took part in many international conferences, cooperation assignments, training session and technical assistance contracts for contingency planning and response equipment selection for Cedre's clients and partners in over twenty countries.

He without a doubt ranks among the international spill response experts with the greatest experience in defining and selecting appropriate response methods and equipment.

Appointed Deputy Director in 1995, he was indisputably the steadfast cornerstone of Cedre's scientific, technical and operational organisation.

He can now enjoy his newfound freedom to travel the world in his motorhome and expand his knowledge of his Scottish beverage of choice.

Bernadette LANUZEL

After just over 6 years in a Brest-based accounting firm, Bernadette joined the team at Cedre in its early days, in 1982.

Her responsibilities mainly included accounts receivable, social management, contract management, cash flow management, budget development and compensation claims. In 2013, she was promoted to the position of chief accountant, in which she was in charge of preparing the financial statement, general accounting, the payroll with its permanent changes, payroll and tax declarations, together with budget development and cashflow management as previously.

She was an eyewitness to the accounting, fiscal and financial changes at Cedre over her 35 years with us.

A keen runner, she has travelled across Finistère every which way in innumerable sporting competitions and always with a smile. We wish her a long and happy retirement, with her grandchildren following in her cheerful wake.

22nd Cedre Information Day

28th September

Programme

French - English
SIMULTANEOUS TRANSLATION

09:30 Opening introduction - Stéphane Doll, Director of Cedre

SESSION 1 — A common concern

Chaired by Stéphanie Cubier, French Ministry of the Environment

09:50 Past incidents and world statistics
Stéphane Le Floch, Cedre

10:10 Organisation and roles of French stakeholders in sea ports
Lionel Try, French Maritime Affairs Directorate

10:30 Break

10:50 Response techniques and products: what options?
Romain Dietschi and Christophe Rousseau, Cedre

11:10 Planning and training: two pillars of preparedness
Natalie Monvoisin, Cedre

11:30 Round table

12:00 Lunch

SESSION 2 — Specific pollution issues for each port

Chaired by Patricia Mani, President of Cedre's Strategy Committee

13:30 Approach and issues in a Mediterranean port
Pierre Bouchet, Ports of Monaco

13:50 River approach on the Rhine
Alex Roth and Patrice Petit, Bas-Rhin Fire Brigade

14:10 Feedback from an oil spill
Wiebbe Bonsink, HEBO Maritiemservice B.V., Rotterdam

14:50 International vision of the difficulties of cleaning port infrastructures - ITOPF

15:10 HNS and multimodal transport
Philippe Riou, Port of Marseille

15:30 Discussion

16:20 Conclusions and closing remarks - Stéphane Doll, Director of Cedre

Spills in ports are relatively frequent and may be due to a wide variety of causes: ships, accidental bilge water discharge, failure of industrial facilities or port infrastructures, run-off from sewer systems or rainwater drainage pipes, containers falling overboard...

Spill prevention and response are therefore a common issue for different types of port terminals. However, each facility has its own specificities according to its size, activities, layout, organisation and equipment. It is with this as a backdrop that specialists in the field will be offering feedback from past incidents at the 2017 Cedre Information Day.

Where?

Ecole Militaire
1, Place Joffre - 75007 PARIS

How?

- To register please download, complete and return the form available at www.cedre.fr
- Participation fee, 120 euros, including lunch.

→ Hot off the press

Several Cedre Technical Newsletters have been released since the beginning of the year. These documents are a gold mine of information, offering a summary of our technology intelligence on accidental pollution in marine and inland waters. They also include data on past incidents, a review of operational discharges in mainland France, information on response preparedness, oil recovery and slick drift, as well as references to recently published guidelines and recommendations.

Inland Waters
Technical Newsletter N°25
2nd half 2015

Sea & Shore
Technical Newsletter N°42 & 43
2nd half 2015 and 1st half 2016

Full collection available free of charge at cedre.fr, Resources section

Learning guides

Understanding Chemical Pollution at Sea
Learning guide - 2012, 96 pages.

Understanding Black Tides
Learning guide - 2006, 118 pages.

Operational Guides

- **Aerial Observation** (2010), 61 pages.
- **Containers and Packages** (2001), 83 pages.
- **Custom-Made Barriers** (2012), 88 pages.
- **Dispersants** (2005), 54 pages.
- **Ecological Monitoring** (2001), 37 pages.
- **Local Authorities** (2012), 76 pages.
- **Mangroves** (2017), 93 pages.
- **Manufactured Booms** (2013), 95 pages.
- **Pollution in Ports** (2007), 49 pages.
- **Sea Professionals** (2012), 100 pages.
- **Skimmers** (2017), 93 pages.
- **Sorbents** (2009), 52 pages.
- **Surveying** (2006), 41 pages.
- **Vegetable Oil** (2004), 35 pages.
- **Volunteers** (2012), 52 pages.
- **Waste Management** (2011), 81 pages.

Chemical Response Guides

- **Ammonia,** 68 pages.
- **Benzene,** 57 pages.
- **Chloroform,** 44 pages.
- **1,2-Dichloroethane,** 61 pages.
- **Dimethyl disulphide,** 54 pages.
- **Ethyl acrylate**, 57 pages.
- **Methyl Ethyl Ketone,** 70 pages.
- **Methyl Methacrylate,** 72 pages.
- **Phosphoric acid,** 76 pages.
- **Sodium hydroxide, 50 % solution,** 57 pages.
- **Styrene,** 62 pages.
- **Sulphuric acid,** 64 pages.
- **Unleaded gasoline,** 56 pages.
- **Vinyl chloride**, 50 pages.
- **Xylenes,** 69 pages.

MORE INFORMATION

See www.cedre.fr, Documentation section
Information Department
Tel.: + 33 (0)2 98 33 67 45 10 45 (or 44)
documentation@cedre.fr

Cedre

Emergency hotline (24/7)
+33 (0)2 98 33 10 10

Information BULLETIN Cedre

International experts
in spill preparedness and response

715, rue Alain Colas - CS 41836
29218 BREST CEDEX 2
FRANCE
Tel.: +33 (0)2 98 33 10 10
Fax: +33 (0)2 98 44 91 38
contact@cedre.fr

www.cedre.fr

Follow us on