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Information Bulletin

Centre of Documentation, Research and Experimentation on Accidental Water Pollution

FEATURE
Legal framework governing spills

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Vegetable oil in a ship's wake

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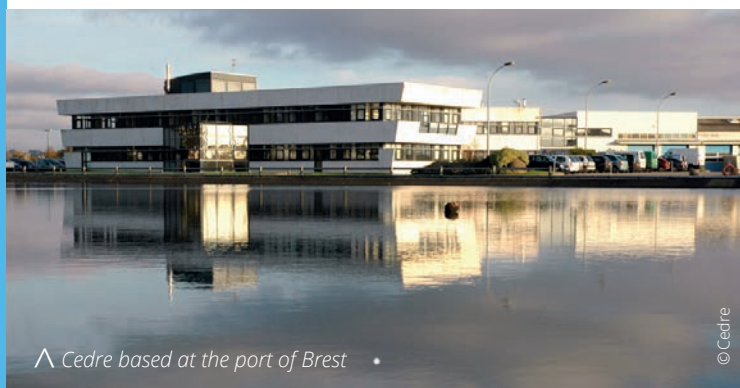

Cedre based at the port of Brest

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EDITORIAL

The 12 December 1999 was a grave day for the shores of France: the *Erika* broke in two, releasing dark slicks of fuel oil which engulfed 400 kilometres of coastline. Before the *Erika* came the *Torrey Canyon* and the *Amoco Cadiz*; after came the *Prestige*, *Solar 1*, *Bright Artémis* and many, many more names which brought with them wave after wave of black oil unleashed on the shores and destroying marine ecosystems. Yet oil tankers are not the only threat: chemicals, containers or cargo, of whatever type, can pose dire risks in the event of a spill at sea.

Such incidents are intrinsically transnational, as much by their flag as by the damage they cause, which pays no heed to borders and causes harm to a global public good: the environment. Consequently, the response to such incidents must be international. In line with this reasoning, the International Maritime Organization (IMO) established a regulatory framework for accidental ship-source pollution in 1969.

This framework covers three main aspects: prevention, mitigation and compensation. The MARPOL Convention focuses on prevention. Oil spill mitigation is governed by the International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC). Finally, liability and compensation are covered by a number of Conventions, including the 1969 CLC Convention and the 1992 Fund Convention.

While these legal instruments have since been further developed and ramified, their application nevertheless requires a strong commitment by States which is still lacking. For instance, the 2010 HNS Convention on the transport of hazardous and noxious substances by sea has still not entered into force due to an insufficient number of ratifications. Against this backdrop, the mobilisation of stakeholders, such as Cedre, is crucial to ensure consistency between environmental objectives and shipping practices. This bulletin seeks to review existing legislation with a view to gaining a better grasp of its future.

Wishing you an interesting read,

Marine de Carné-Trécesson,
Ambassador, Permanent Representative of France to the
International Maritime Organization

Sinking of bulk carrier *Rubymar* in the Red Sea

By Stéphane Le Floch, Research Department Manager at Cedre

The Belize-registered bulk carrier *Rubymar* was damaged during a missile strike by Yemen rebels (Houthis) on 18 February 2024 in the Bal el-Mandeb Strait, causing the crew to be evacuated the following day. After drifting for several days, the vessel sank on 1st April in waters 100 metres deep in the Red Sea, near the Hanish Islands, fuelling fears over the potential environmental damage, in particular due to the presence of numerous coral reefs. The *Rubymar* was transporting a cargo of fertiliser (22,000 tonnes of nitrogen-, phosphorus- and sulphur-based products), 200 tonnes of bunker fuel, identified as VLSFO** (Very Low Sulphur Fuel Oil), 41 tonnes of LSMGO* (Low Sulphur Marine Gasoil*) and 20 tonnes of lubricants.

Given the particularly harsh sea and weather conditions together with a cargo identified as hazardous (fertilisers initially believed to be ammonium nitrate), the Yemen Government requested technical assistance from the United Nations. This request was accepted and a team was quickly put together. Due to the geopolitical context in the area where the vessel sank, the team operated in a hybrid mode, with five people based in Aden (Yemen) and seven working remotely. Among the remote team members, the European Emergency Response Coordination Centre (ERCC) called on three European spill response experts from Cedre (France), ISPRA (Italian Institute for Environmental Protection and Research) and CCME (German Central Command for Maritime Emergencies). Cedre was the coordinator of this triad. The main mission was to provide an analysis of the situation and consequently offer technical advice to mitigate the pollution risk. This analysis was also to include an assessment of the potential environmental impact of a sudden release of cargo and/or fuel.

The remote team's first task was to determine how hazardous the cargo was. The safety data sheet indicated that the cargo was a fertiliser composed of nitrogen and phosphate enriched with sulphur. On the basis of previous work carried out at Cedre, which aimed to characterise the fate of different fertiliser formulas in seawater, the hypothesis of instantaneous dissolution of the entire cargo in the water column was ruled out. The nitrogen, phosphate and sulphur in the cargo were expected to slowly and gradually dissolve in the water column. This conclusion was also based on the reactivity of the fertiliser, which was in the form of slow release pellets. In terms of potential impact on marine fauna, the physico-chemical quality of the waters of the Red Sea was taken into account. Researchers at King Abdullah University of Science and Technology (KAUST) in Saudi Arabia provided support by supplying the results of environmental monitoring of the nitrogen and phosphorus concentrations in the incident area, based on out in previous years. Analysis of this data showed that the Red Sea receives considerable natural nitrogen and phosphorus inputs from the Gulf of Aden, carried by sea currents at this time of year. From one year to the next, these inputs fluctuate significantly but remain high. As an upshot, they boost the resilience of the marine ecosystem to variations in concentrations of these nutrients. This phenomenon, combined with the expected behaviour of the fertiliser, i.e. slow dissolution,

led to the conclusion that a sudden release of the cargo should not have a significant impact on the marine environment in the Red Sea, at most affecting the immediate vicinity of the wreck. The team recommended regular sampling of the water column at various depths around the wreck to monitor the water quality and ensure that the nitrogen and phosphate concentrations remained within the annual variability range charted in previous studies.

As for the oil, the aim was to determine the physical and chemical characteristics of the products (Table 1) in order to model their fate and recommend appropriate response strategies. Low sulphur products are blends of oils and oil fractions of different origins, for which there is no standard composition. The chosen approach involved drawing on the results of a European DG-ECHO-funded project (IMAROS), in which Cedre is a partner, in order to forecast changes in the viscosity of the oils on board the *Rubymar* if released into the Red Sea. Using this data together with environmental data provided by Copernicus Global (1/12°) for sea currents and Météo-France World for winds, the fate of the oil was modelled by Cedre's response team. Based on the simulation results, a cone of probability for the presence of oil slicks was defined, the base of which was located on the coast of the Hanish Islands. In terms of recommendations, the remote team advised prioritising containment and recovery at sea, advised against chemical dispersion of the oil slicks due to the ecosystem's sensitivity, and recommended pre-positioning response equipment on shore, particularly in the Hanish Islands. The European Maritime Safety Agency (EMSA) contributed by providing satellite imagery of the area to ensure that there were no oil slicks drifting on the sea surface.

The remote team's mission ended on 19 April after presenting the main above-mentioned conclusions. The wreck is currently still partially submerged at a depth of around 100 m, pending a treatment solution.

**Low Sulphur Marine Gasoil (max. 0.1%)*
***Very Low Sulphur Fuel Oil (max. 0.5%)*

Product name	LSMGO*	VLSFO**
Viscosity in cSt at 40/50°C	3.30	69.02
Volume in tonnes	41	200
Density at 15°C	0.8284	0.9078
Sulphur content (%m/m)	0.05	0.481
Flash point	63	98
Pour point	-24	27
Water content		0.1

⋀ *Main characteristics of the low sulphur fuel oils contained in the wreck of the Rubymar*

The legal framework governing spills

By Nicolas Tamic, Deputy Director and Operations Manager at Cedre, and Agnès Herbert and Yseult Savy, students on an internship at Cedre studying for a Master's course in Law of Maritime Spaces and Activities (UBO)

In 1958, Prince Wan Waithayakon, President of the United Nations Conference on the Law of the Sea held in Geneva, asserted that the sea was "the common heritage of mankind" and that the law of the sea should "ensure the preservation of that heritage for the benefit of all". The 1982 United Nations Convention on the Law of the Sea (UNCLOS) aimed to consecrate this principle of preservation, notably through articles 192 and 194, which provides that States have the obligation to protect and preserve the marine environment, particularly with regard to pollution risks posed by maritime traffic.

Internationally

To fulfil this obligation, France has ratified the main international conventions relating to prevention, preparedness and response to spills of oil and hazardous and noxious substances (HNS). These include the 1973 International Convention for the Prevention of Pollution from Ships (MARPOL) and the 1990 International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC). France has also implemented these obligations through a robust national operational response system.

1. MARPOL Convention

Under the MARPOL Convention, France is required to comply with the rules laid out in its annexes in order to reduce marine pollution by ships flying its flag. Annexes I, II and III deal respectively with the rules relating to the prevention of pollution by oil, noxious liquid substances (NLS) and harmful substances carried by sea in packaged form.

1.1 Annex I

The discharge of oil into the marine environment by vessels of a certain capacity is prohibited in certain areas and restricted in others. Allowable discharges are dependent on compliance with strict conditions relating to the ship's navigational situation, its size, the rate of discharge, the equipment used and the origin of the oil. The requirements are more stringent for discharges in special areas such as the Antarctic.

Oil tankers of 150 gross tonnage and above and all ships of 400 gross tonnage and above must carry a Shipboard Oil Pollution Emergency Plan including the spill notification procedure, the information required to reduce or control a discharge and the action to be taken (Chapter 5 of MARPOL Annex I).

1.2 Annex II

Discharges of noxious liquid substances classified as category X (major hazard), Y (hazard) and Z (minor hazard) are prohibited unless specific conditions are met. Discharges of substances in the OS category (Other Substances, considered to present no harm) are authorised under certain conditions related to the ship's speed, distance from the nearest land and the total concentration not exceeding 1/10.

All ships of 150 gross tonnage and above carrying NLS must carry a shipboard marine pollution emergency plan covering the spill notification procedure, information to reduce or control the discharge, and the action to be taken (Chapter 7 of MARPOL Annex II).

1.3 Annex III

The carriage of harmful substances is prohibited except in accordance with the provisions of Annex III. These provisions relate to packing, marking, labelling, documentation, stowage, quantity limitations and exceptions for the purpose of securing the safety of the ship or saving life at sea. Flag States must introduce legislation to ensure that ships flying their flag comply with the IMDG (International Maritime Dangerous Goods) Code by carrying out onboard inspections.

2. OPRC Convention

The OPRC Convention and its 2000 Protocol on Preparedness, Response and Co-operation to pollution Incidents by Hazardous and Noxious Substances (OPRC-SNPD Protocol) require State Parties to prepare for and respond to oil and HNS pollution incidents in three ways: through contingency planning, preparedness and response, and co-operation.

2.1 Contingency planning

Ships flying the flag of State Parties, offshore units, sea ports and oil handling facilities must have an oil or HNS pollution emergency plan co-ordinated with the national system (with the exception of offshore units in the case of HNS pollution) (Article 3 of the OPRC Convention and HNS Protocol). States are also required to put in place procedures for reporting oil or HNS discharges and to notify States liable to be affected (Articles 4 and 5 of the OPRC Convention and Article 3 of the HNS Protocol).

2.2 Spill preparation and response

Each Party is required to establish a national system for responding promptly and effectively to pollution incidents, including a contingency plan, a minimum level of equipment, a programme of exercises and training of relevant personnel. This system should include, as a minimum, the designation of: the competent authorities for pollution preparedness and response, a national operational contact point responsible for the receipt and transmission of pollution reports, the authority entitled to request assistance or to decide to render the assistance requested (Article 6 of the OPRC Convention and Article 4 of the HNS Protocol).

FOCUS

Cedre and the MARPOL Convention

Cedre offers personalised support to public and private stakeholders for the drafting and implementation of oil and chemical spill contingency plans.

2.3 Co-operation

The Parties also agree to co-operate through bilateral or multilateral agreements in the event of a major incident, to improve oil and HNS spill response techniques, to facilitate the transfer of spill response technology and to provide technical assistance upon the request of States (Articles 7 to 10 of the OPRC and Articles 5 to 7 and 10 of the HNS Protocol).

Nationally

As France lies at the confluence of shipping routes with very high accident rates, it has developed an original operational response system.

A broad range of stakeholders are involved in dealing with a spill at sea, mainly national authorities, each with a defined area of competence for a given geographical zone: the maritime prefect, the representative of the State at sea, the departmental prefect, the defence and security zone prefect and the mayor if the pollution reaches the coast.

In a crisis situation, these authorities co-ordinate their actions through the ORSEC *(Organisation de la Réponse de la Sécurité Civile)* system, which operates at maritime, departmental and zonal level. Each ORSEC plan lays down the general organisation of response operations in the given zone and the resources that can be mobilised, under the authority of the relevant prefects and the representative of the State at sea (Articles L. 741-1 to 4 of the French Internal Security Code, CSI). These plans, revised at least every five years, include provisions that are specific to the risks in each zone (Article L. 741-6 CSI). The maritime ORSEC system comprises a section on the response to marine pollution (POLMAR), while the departmental and zonal ORSEC plans include a specific mechanism for the land-sea interface (POLMAR-Terre).

During spill response operations, the representative of the State at sea directs offshore operations and informs the land authorities if there is a risk for the coastline (POLMAR Instruction of 19 July 2022). The defence and security zone prefect coordinates shore-based operations and ensures consistency at the land-sea interface, liaising with the prefects of the affected departments, who are responsible for directing response operations within their department. Offshore operations are overseen by the General Secretariat for the Sea and the Coast Guards Functions Operational Centre, while onshore operations are supervised by the Minister of the Interior and the Interministerial Crisis Management Operations Centre. Spill management is divided into three phases: the emergency phase, aimed at stopping the spill and its impacts, the support phase and the post-incident phase which marks the end of response actions targeting the direct effects of the spill.

The national authorities can be assisted by accredited technical and scientific experts specialised in spill response (Article L. 211-5-1 of the French Environment Code), such as Cedre. These experts help to identify the pollutant, monitor its drift, optimise response resources and carry out technical and environmental monitoring. They can take part in clean-up operations if they are State-approved environmental protection associations (Article L. 611-1 of the French Environment Code). Over and above crisis management, they contribute to the development of specific ORSEC provisions, the organisation of exercises and the provision of training.

In terms of funding, spill response expenses may be covered by POLMAR crisis funding when they constitute necessary and exceptional expenditure by the State, local authorities and their public establishments or associations and if it has been incurred to respond to a sufficiently large non-chronic, accidental or deliberate marine pollution incident (Prime Minister's Instruction on POLMAR crisis funding of 5 March 2018).

FOCUS

Cedre and the OPRC Convention

Cedre contributes to the implementation of the provisions of the OPRC Convention and its OPRC-HNS Protocol by:

- assisting public authorities in drawing up oil and HNS spill contingency plans;
- providing advice on the identification and quantification of pollutants, as well as on environmental risks;
- participating in national and international spill response exercises;
- training public and private stakeholders in oil and HNS spill response at sea, in inland waters and on the shoreline;
- actively cooperating with signatory States in relation to research, development and information dissemination on oil and chemical response techniques.

States' obligations regarding pollution prevention and control

By Yann Rabuteau, Legal expert in maritime and coastal activities and the marine environment

"Prevention is better than cure". This time-honoured saying lends itself well to the legal framework for the protection of the marine environment against accidental pollution. Prevention is expressed first and foremost by the rules governing navigation safety, collision avoidance, ship design and crew training. In this regard, numerous international responses have been constructed, many of which are long-standing, through the International Maritime Organization and are binding upon Parties: for instance, the 1972 COLREG Convention, MARPOL 73/78 and the 1978 STCW Convention. Yet prevention does not always suffice to avoid pollution, in which case a cure or, in more operational terms, incident response measures must be implemented. Here again, the responses are international due to the very nature of the risk and the consequences of the pollution, which can extend from the open sea to the inland waters of a coastal State. In the event of marine pollution involving several States, international cooperation is of particular importance. This article outlines the key principles and points of States' obligations regarding the prevention of and response to marine pollution, through a selection of legal frameworks.

Prevention as a general principle: "States have the obligation to protect and preserve the marine environment"

This essential statement on preventing and responding to marine pollution is set out in the 1982 UNCLOS Convention: in article 192, a general obligation opens a part specifically devoted to the protection and preservation of the marine environment (Part XII). Thus, States party to the Convention *"shall take, individually or jointly (...) all measures consistent with this Convention that are necessary to prevent, reduce and control pollution of the marine environment (...), using for this purpose the best practicable means at their disposal and in accordance with their capabilities, and they shall endeavour to harmonize their policies in this connection"* (article 194). To this end, States must deal with all sources of pollution, and in particular pollution from vessels, by taking measures for preventing accidents and dealing with emergencies, ensuring the safety of operations at sea and preventing intentional or unintentional discharges.

The Convention goes on to set out a whole series of obligations for States: these include, for instance, the obligation to notify other States of any pollution liable to cause or having caused damage to the marine environment (article 198), and to develop contingency plans for responding to pollution incidents (article 199).

Finally, under article 235 of the Convention, "*States are responsible for the fulfilment of their international obligations concerning the protection and preservation of the marine environment. They shall be liable in accordance with international law*".

Clean-up operations following the sinking of the Agia Zoni II *(Greece - September 2017)*

Overflight above the container ship CSL Virginia *and view of the breach in the ship's hull (France, October 2018)*

Principle of action: preparedness and co-operation for an effective response

Faced with the succession of ship-source oil spills and the threats posed by HNS spills, IMO drafted the International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC Convention, 1990), later supplemented by the 2000 Protocol on Preparedness, Response and Co-operation to pollution Incidents by Hazardous and Noxious Substances. Under this Convention, port authorities and operators of oil handling facilities in a State that is Party to the Convention must have oil spill contingency plans, harmonised with national contingency plans. Article 4 of the Convention requires masters of ships to report the presence of oil at sea or any event involving a discharge or probable discharge of oil. Upon receipt of an oil pollution report, an immediate assessment must be carried out and sent to all States likely to be affected, as well as to IMO or the competent regional organisation. More importantly, article 6 requires Parties to designate the competent authorities for oil pollution preparedness and response and for the receipt and transmission of oil pollution reports, and the authority entitled to request assistance or decide to render the assistance requested. States Parties are required to have a minimum level of oil spill response equipment, as well as a training programme, exercises and communication plans. Finally, and this is a key factor in spill response, the OPRC Convention organises co-operation between States Parties as concerns marine pollution response techniques and equipment. The Convention encourages States to work together to combat oil pollution: technical support, transfer of technology, joint research and development programmes to effectively respond to marine pollution, and the conclusion of agreements for pollution response, including hazardous and noxious substances.

CONVENTIONS

COLREG

Convention on the International Regulations for Preventing Collisions at Sea, 1972

STCW

International Convention on Standards of Training, Certification and Watch-keeping for Seafarers, 1978

UNCLOS (Montego Bay)

United Nations Convention on the Law of the Sea, 10 December 1982

For the purposes of this article, only accidental ship-source pollution of the marine environment is addressed. Other accidental pollution sources are of course covered by law in terms of the obligations of States (prevention and response in particular), such as pollution from offshore oil activities and industrial pollution from land-based sources. Similarly, other relevant international or European provisions could be presented, relating to the repression of illegal discharges in the marine environment.

Regulations governing discharges or spills of polluting or harmful substances in France

By Solenn Briand, Brest's Deputy Public Prosecutor in charge of the specialised coastal jurisdiction and the regional environmental unit

The French Environment Code addresses accidental marine pollution from a point of view of ship-source pollution offences, which come under a specific regime. Polluters may be charged with the offence of discharging substances liable to cause harmful effects to health or damage to flora or fauna into surface, ground or marine waters, an offence that can be aggravated since French Law no. 2021-1104 of 22 August 2021 in the event of a manifestly deliberate breach of duty of care or safety.

Ship-source discharges

To provide an effective response to the specificities of marine pollution, articles L218-1 to L218-86 of the French Environment Code, derived from French Law no. 85-583 of 5 July 1983 and taken directly from the MARPOL Convention render it possible to condemn ship-source discharges of polluting substances and provide effective procedural tools.

Under these provisions, French law applies to vessels flying the French flag, regardless of where the offence is committed, and to foreign vessels in French territorial waters. It distinguishes between intentional discharges and accidental spills.

Under article L218-19 of the French Environment Code, it is an infringement for the master of a ship to cause a discharge of a polluting substance or a maritime accident resulting or liable to result in oil pollution, or to fail to take the necessary measures to avoid an accident when the latter has resulted in oil pollution.

This offence applies to discharges of substances regulated by the MARPOL Convention: oil, noxious liquid substances carried in bulk or in packaged form, sewage and garbage from ships.

The behaviour having caused this pollution or pollution risk must be a simple fault of carelessness, negligence or failure to comply with laws and regulations. Penalties are more severe if the offences consist in a manifestly deliberate breach of a specific duty of safety or care laid down by a law or regulation, or if the fault committed exposed the environment to a particularly serious risk of which the perpetrator could not have been unaware. In the case of gross negligence, sentences are further increased where irreversible or particularly severe damage has been caused to the environment.

Paraffin slick in the Mediterranean

If the ship has suffered damage or if the discharge is carried out for safety, salvage or pollution response purposes, article L218-20 states that such acts are not punishable.

Thus, when a spill occurs at sea, the investigation must identify all the causes contributing to the accident in order to determine the types of faults committed, their degree of seriousness and their imputability. While the environmental impact may constitute an aggravating circumstance for offences, evidence of the harmful nature of the substances discharged is not a constitutive element of the offences provided for in article L218-9 of the French Environment Code.

In order to effectively clamp down on discharges of polluting substances at sea, under article L218-30 of the French Environment Code the public prosecutor or examining magistrate may divert and detain the ship from which the discharge occurred at the shipowner's expense. The detention may be lifted following payment of a bond, whose amount is set by the judicial authority. This procedure ensures that the vessel remains in a French port and that the necessary investigations can be carried out to determine responsibilities for the pollution.

In 2001, specialised coastal jurisdictions (JULIS) were created in France to deal with ship-source pollution offences. The courts of Le Havre, Brest, Marseille, Fort-de-France, Saint-Denis in Réunion and Saint-Pierre-et-Miquelon have extended territorial jurisdiction to deal with maritime pollution incidents that come under articles L218-1 to L218-86 of the French Environment Code. These specialised courts and local courts are concurrently competent for the investigation, prosecution, trial and judgment of the offences concerned.

Discharges and spills of harmful substances

The MARPOL Convention and its transposition into French law in articles L218-1 to L218-86 of the French Environment Code are effective tools for the repression of maritime pollution.

However, certain incidences of accidental marine pollution do not come under the above-mentioned regime. Ship-source discharges are punishable offences if the substance is covered by the MARPOL Convention (oil, sewage and garbage from ships, noxious substances).

When a case of accidental pollution does not fall within the scope of the MARPOL Convention, it may be covered by articles L216-6 and L231-1 of the French Environment Code. Under these provisions, it is a criminal offence to discard, discharge or release into surface waters, groundwater or marine waters, within France's territorial waters, a substance whose action or reactions result, even temporarily, in harmful effects on health, damage to flora or fauna or restrictions on the use of bathing areas. The sentence is more severe if the discharge is the result of a manifestly deliberate breach of a specific duty of care or safety laid down by law or regulation, and if the harmful effects on the environment are serious and lasting.

Aerial observation of pollution at sea

This classification does not cover discharges of harmful substances beyond the country's territorial waters.

To demonstrate the infringement, evidence of a harmful effect of the substance on the environment must be provided. In the marine environment, even the most noxious substances are rapidly diluted, hence this evidence can be difficult to obtain. Given that in criminal cases in France all modes of proof are admissible, the harmful nature of the substance may be demonstrated by an expert assessment, but also by visual observations on site or on the shoreline, or by studying the composition of the substance in question. There are few legal precedents on the definition of this notion of harmful effects, which is left to the sovereign judgement of the courts.

If an offence involving the discharge of a harmful substance into water is unintentional, depending on how it is classified, evidence of carelessness, negligence or failure to comply with regulatory obligations must be provided; otherwise, evidence of a manifestly deliberate breach of a particular duty of care and safety must be gathered.

Since 2021, specialised regional environmental units have been set up: for each court of appeal, the competence of a lower court has been expanded to include the remit of the court of appeal for the investigation, prosecution, instruction and judgment of certain offences under the French Environment Code. The courts designated as regional environmental units have concurrent competence with the courts within whose jurisdiction the events took place.

Accidental marine pollution is therefore governed, in terms of criminal proceedings, by the MARPOL Convention and its implementation in French law, which have introduced offensive tools to crack down on such pollution. The French Environment Code covers other maritime pollution situations, in particular when the substances are unknown or unregulated but may be harmful to the environment.

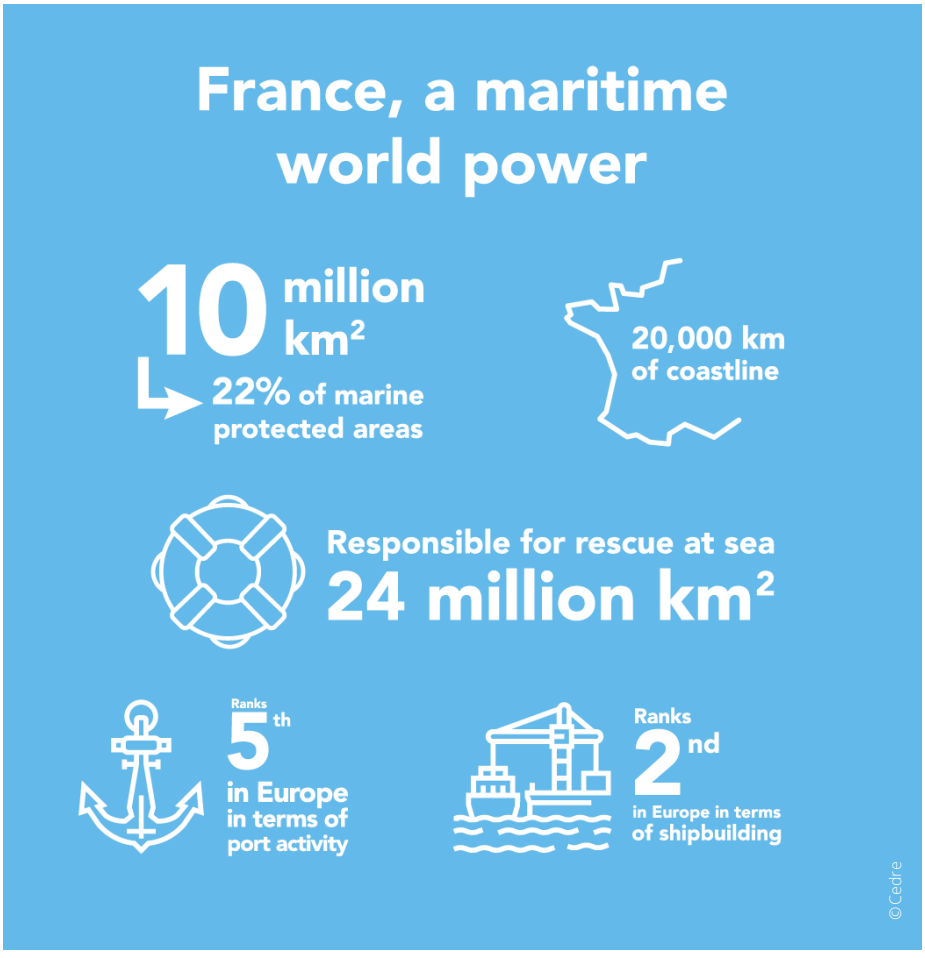
France's action within IMO towards the regulation of accidental marine pollution

By Maxime Legathe, Administrator of Maritime Affairs to IMO

France, a driving force within the International Maritime Organization (IMO)

France has asserted its role as a key player in International Maritime Organization (IMO) ever since it was established in 1948. As a founding member, France has been a continuously-elected member of the Council in its capacity as one of the States with the largest interest in international seaborne trade. This continuous presence goes hand in hand with active participation in the work of the organisation. Between 2022 and 2023, France was the leading European contributor and ranked fourth in the world, with 128 documents submitted. This productivity can be explained by the cross-sector expertise of the French delegation, which takes part in 155 working groups.

France's ubiquity at IMO reflects its position as a global maritime power: its exclusive economic zone is spread across all of the world's oceans and covers more than 10 million km², including 22% of the world's marine protected areas. With over 20,000 km of coastline, France is a key player in the safety of navigation, being responsible for rescue at sea over almost 24 million km². In economic terms, France ranks fifth in Europe in terms of port activity and second in terms of shipbuilding. The complexity and innovation of its ships set France apart as a leader in maritime technology. Due to these geographical, economic and technical assets, France plays a crucial role in global maritime governance, both from a technical point of view, thanks to its expertise which offers valuable input, and from a geopolitical point of view. This influence is channelled into the prevention of accidental pollution.



France's strong commitment to spill prevention and response

The *Torrey Canyon* disaster in 1967 brought to the fore the need for a regulatory framework on accidental pollution. France was one of the instigators behind the first International Convention on Civil Liability for Oil Pollution Damage adopted in 1969. Since then, the country has been committed to promoting a strong and pragmatic environmental maritime ambition within IMO. The main international conventions governing spill prevention and response include the International Convention for the Prevention of Pollution from Ships (MARPOL), the London Convention, the International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC) and the International Convention on Civil Liability for Oil Pollution Damage.

These conventions create obligations for States in relation to spill preparedness and response, thereby strengthening their capacity to manage environmental crises at sea. By supporting the adoption and reinforcement of these regulations, France plays a fundamental role in protecting the marine environment and promoting best practices in maritime safety. This was particularly the case at the latest meetings of the Sub-Committee on Pollution Prevention and Response (PPR) and the Marine Environment Protection Committee (MEPC) in 2024.

⋀ *An expert from Cedre conducting a survey of the Mediterranean shoreline*

⋀ *Plastic pellets washed up on the shore*

Work in progress: plastic litter, atmospheric pollution, heavy fuel oils and marine pollution

The 11th session of the Sub-Committee on Pollution Prevention and Response was held in February 2024. France played a proactive role in discussions on the prevention of accidental pollution, with a particular focus on plastic litter and atmospheric emissions. For instance, it supported the drafting of a circular on the transport of plastic pellets, encouraging the MEPC to strengthen control and transport measures. Although the proposal to recognise plastic pellets as "marine pollutants" did not achieve the necessary consensus, it did help to highlight the need to regulate their transport.

In terms of atmospheric pollution, France also supported several draft resolutions aimed at reducing black carbon emissions. Specific measures have been adopted to improve the control of emissions from ship engines, as well as recommendations for drawing up local oil spill contingency plans.

This work was continued in October 2024 at the 82nd session of the Marine Environment Protection Committee (MEPC). France pronounced itself in favour of the adoption of guidelines on the clean-up of plastic pellets from ship-source spills and draft guidelines for the development of local contingency plans for spills or pollution involving oil or hazardous and noxious substances. Meanwhile, it upheld its commitment towards protecting the Arctic by backing amendments aimed at mitigating the risks associated with the use and transport of heavy fuel oils, particularly for ships not covered by the Polar Code.

French expertise illustrated by successful collaboration with Cedre

As part of the work of IMO, the French representation benefits from French groups with outstanding technical expertise. The PPR 11 Correspondence Group on Pollution Response, for instance, was chaired by Dr Camille Lacroix, Aquatic Litter Monitoring and Studies Department manager at Cedre. Cedre also has very close ties with the International Oil Pollution Compensation Funds (IOPC Funds), with which it has observer status. In March 2024, Cedre organised two round table debates on chemical risks at sea in connection with the Hazardous and Noxious Substances (HNS) Convention and on new shipping fuels. The debates involved IOPC Funds experts, including its Director Gaute Sivertsen.

In addition to information dissemination, Cedre offers online training modules and operational guides on spill response and clean-up. This strong collaboration illustrates the involvement of stakeholders in the establishment of standards in order to channel the latest research into conventional development.

Finally, this synergy can also be seen in the implementation of standards, whereby Cedre ensures consistency with the operational needs of maritime authorities when assessing discharge water from exhaust gas control systems. Within IMO and the IOPC Funds, France and Cedre work hand in hand to bolster the maritime pollution response capacity.

Cedre, a key player in the response to marine spills

By Nicolas Tamic, Deputy Director and Operations Manager at Cedre

The decision to create Cedre was made at the Council of Ministers meeting on 5 July 1978, based on the post-incident review conducted by the French authorities after *Amoco Cadiz* sank off the coast of Brittany. Cedre was registered as an association, based in Brest, on 25 January 1979. Cedre's goals and purpose, as defined in its articles of association, have remained steadfast ever since, while adapting to changes and activities in the maritime sector and inland waters.

Civil protection

Cedre is first and foremost a civil protection organisation. Approved by the French Ministry of the Interior's Directorate-General for Civil Protection and Crisis Management (DGSCGC), Cedre works alongside the authorities in charge of response to spills in surface waters, both at sea and in inland waters. Cedre is tasked with providing its expertise and technical assistance (24/7 emergency hotline) to emergency operations managers (maritime prefects, departmental prefects, mayors) in the event of a pollution incident, as well as to defence and security zone prefects and inter-municipal authorities, within the ORSEC framework as defined by the French Internal Security Code and the Prime Minister's instruction of 19 July 2022. Cedre's expertise gradually extended beyond national borders to assist international organisations and States faced with major spills through international mutual aid mechanisms coordinated by the United Nations and the European Union.

Technical adviser for France in international bodies

Cedre's distinctive approach lies in the fact that its expertise spans the entire response spectrum: before, during and after a spill. This broad vision means that it is able to support the French authorities through the different organisations responsible for spill prevention and response. Cedre is an integral part of the French representation to the International Maritime Organization (IMO) and its regional members such as the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC), the Regional Marine Pollution Emergency, Information and Training Centre for the Wider Caribbean (REMPEITC) and the Global Initiative for West, Central and Southern Africa (GI-WACAF). It advises France within the Bonn Agreement and has observer status with the International Oil Pollution Compensation Funds (IOPC Funds).

Response methods and techniques

As set out in its articles of association, Cedre is committed to driving forward spill response methods and techniques by testing response equipment and products to determine their effectiveness. These test campaigns may be carried out at Cedre's technical facilities or *in*

Aerial view of Cedre's facilities

situ. Examples of such tests are the annual trials carried out in the Loire Estuary for PNE POLMAR-Terre *(Pôle National d'Expertise)* and the *Grand Port Maritime de Nantes Saint-Nazaire*. Cedre also supports the spill response industry, with companies regularly using Cedre's test tanks to trial and adapt their response equipment.

Professional training centre

Cedre is a professional training centre that provides training for State representatives involved in spill response. Its training courses are Qualiopi-certified and accredited by the Nautical Institute, and are run to IMO standards. It provides training for all levels of responders, from field operators to incident managers, without forgetting French Navy and Customs aircrews. Cedre also runs both standard and bespoke training courses for the maritime and industrial sectors. Its much sought-after training facilities offer highly realistic conditions. They include seawater test tanks, a man-made beach and a port structure where real oil can be released.

Advice on response equipment investments

Cedre provides support for its members to ensure they have effective response resources. It works closely with State services, in particular PNE POLMAR-Terre and the French Navy's centre of practical expertise in pollution response CEPPOL, in order to meet these entities' needs, as the maritime transport sector evolves. New-generation shipping fuels are therefore the focus of advanced behaviour studies to determine appropriate spill response strategies.

Documentation and information centre

The tasks set out in Cedre's articles of association include the dissemination of information relating to its field of expertise to its members, administrations, industry and the general public. For this, Cedre produces biannual information bulletins, operational response guides and thematic documents, organises information days and takes part in major events for professionals and the general public. It also regularly adds content to its websites via which all its publications are available free of charge.

Measuring the temperature increase in chemicals using a thermal camera

Knowledge development

For 45 years, Cedre has been honing its expertise by taking part in national and international meetings and exercises to compare response strategies, methods and techniques in order to provide the best recommendations to the authorities and its clients. It conducts applied research for many large-scale projects. It boasts analytical capabilities in line with its expertise and develops them to keep pace with changes in the maritime sector. Above all, Cedre boosts its knowledge by joining incident management units and carrying out field missions during real spills. This internationally renowned expertise earned Cedre a United Nations Green Star Award in 2015.

In short, Cedre is a multi-faceted organisation at the crossroads of the maritime sector, government action and the needs of industry and applied research. Its public service and civil protection missions mean that it is duty-bound to remain neutral at all times, making Cedre an expert organisation on which all its partners can rely with complete confidence.

Characterisation of dispersant spraying systems

By Fanny Jouannin, Analysis and Resources Department engineer at Cedre.

Cedre's role in the evaluation of equipment for spill response at sea and on the shoreline

When an oil spill occurs, different response strategies can be implemented at sea and on shore. These strategies, and the associated equipment, evolve based on feedback from past experience, advances in knowledge and new issues such as new fuels. Against this backdrop, ever since its creation, Cedre has been contributing, through its ongoing programme for assessing offshore and onshore response techniques, to the testing and evaluation of equipment that is either on the market or under development and could fill existing gaps or supplement available equipment.

Since 2022, at the request of its partners, Cedre has been testing dispersant spraying systems designed to be installed on all types of vessels, including "vessels of opportunity": tugs, offshore supply vessels, workboats, etc., which may be used as spill response vessels.

Chemical dispersion as a response technique

For over 20 years, chemical dispersion has been one of the main offshore spill response options, alongside recovery. When appropriately used, this technique aims to minimise the damage caused by an oil spill, by diluting the oil in the environment, thereby preventing large-scale deposits from reaching coastal habitats and shores, while promoting natural oil biodegradation and decomposition processes.

However, the use of dispersants is subject to conditions. These conditions governing dispersant use and application have evolved since the first attempts at dispersant use, through feedback and experimentation, thereby enhancing the efficiency of this response technique while regulating dispersant use and limiting its environmental impact.

In areas close to the shore, dispersant use may be prohibited, restricted or subject to prior authorisation. These restricted areas are defined in most countries according to the water depth and the distance from the coast. They may also take into account local environmental specificities (habitat sensitivity, seasonal specificities: fish migration, fishing, etc.).

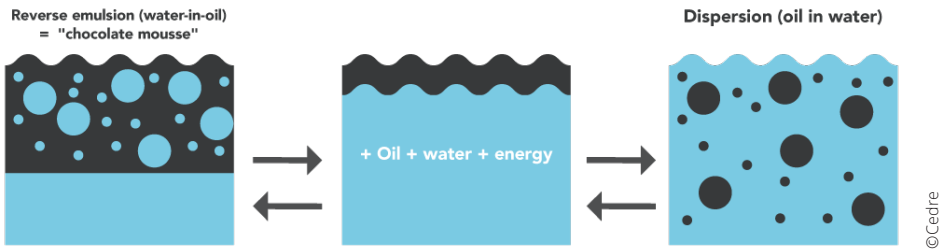
Dispersant quality is also controlled. In most countries, only products that have been tested and subsequently approved, accredited or validated, in accordance with the applicable procedure in the country concerned, may be used. In France, dispersants must undergo efficiency, biodegradability and toxicity tests. These tests are standardised and carried out by Cedre.

Finally, dispersant application or spraying operations must comply with certain recommendations, relating in particular to the window of opportunity for dispersion (time frame during which the oil remains dispersible after a spill), but also to the equipment used (from a vessel or aircraft) and the dispersant application procedures.

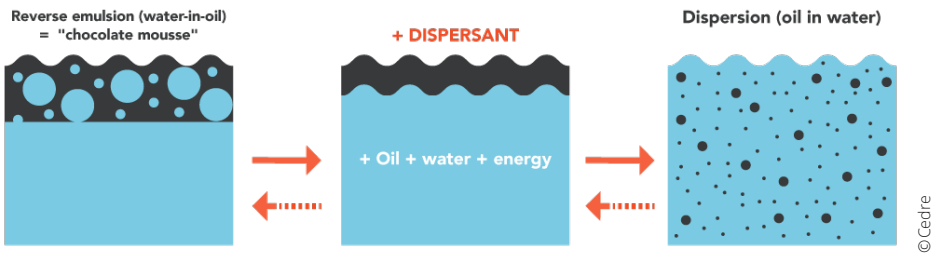
Find out more about spill response product testing in Cedre's laboratory

Assessment of dispersant spraying systems at Cedre

Since 2022, several single nozzle and spray arm systems have been assessed at Cedre, with a particular focus on characterising:



Without dispersant, oil floating on the surface will either form a water-in-oil emulsion (reverse emulsion) or disperse naturally.



Adding dispersant promotes the dispersion of oil droplets in the water and reduces emulsification.

• the homogeneity of the volumes of dispersants applied. By studying the deposition of the dispersant on the ground, we are able to determine the uniformity of application, and therefore the effectiveness of the dispersant in treating an oil slick;

• the size of droplets in the spray plume, studied in partnership with CERTAM (*Centre d'Étude et de Recherche Technologique en Aérothermique et Moteurs),* during dispersant spraying. Droplets with a diameter of less than 300 µm are less likely to reach the slick to be treated due to excessive wind drift. Conversely, particles larger than 500 µm, or even 800 µm, in diameter are more likely to penetrate through thin, non-viscous oil slicks without dispersing them.

The tests carried out on these two types of systems are performed with different products (freshwater, high viscosity dispersant and dispersant diluted to different concentrations in water) in order to study the influence of the surface tension and viscosity of the products sprayed, as well as the impact of the spray rate and pressure.

In the light of these different parameters, the benefits and drawbacks of each system were correlated with the recommendations on chemical dispersion, in particular those set out in the ASTM standards and summarised in the "Standard Guide for Oil Spill Dispersant Application Equipment: Boom and Nozzle Systems" and the "Guide for Oil Spill Dispersant Application Equipment".

Results obtained

For each of these tests, the results were presented as graphs. The graph presented here is a fictitious example.

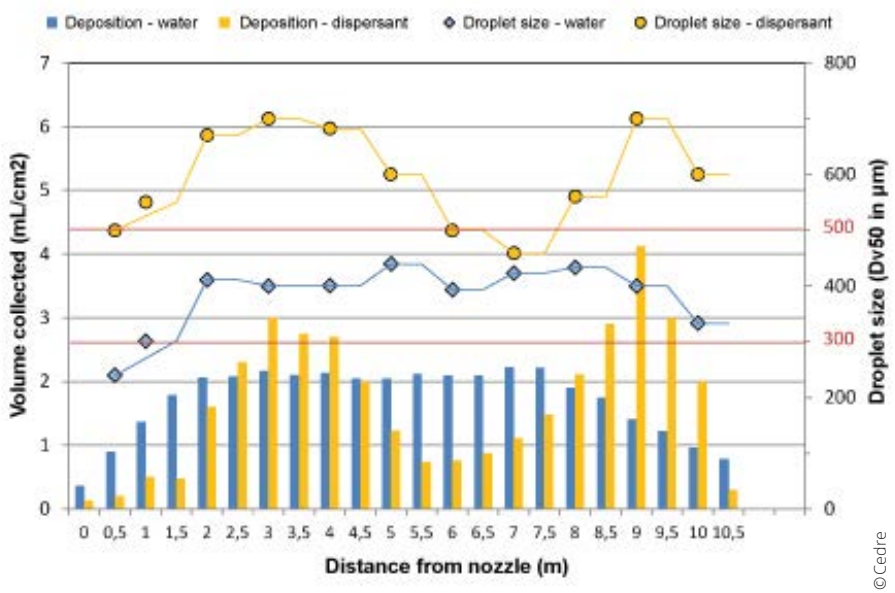
For the systems tested, the results clearly show that the viscosity of the product sprayed plays a major role in the homogeneity of the spray plume, both in terms of deposition and, to a lesser extent, droplet size. The tests have shown that dispersants with a high viscosity can produce a narrower, less scattered spray plume than products with a lower viscosity, and can even form a "solid jet" that is ill-suited to chemical dispersion.

The pressure and flow rate combination and the nozzle shape (conical or flat) also appear to affect, albeit to a lesser extent, the homogeneity of deposition and droplet size.

Further studies could be carried out to identify, for each system, the viscosity limits and the optimal pressure/flow rate combinations in order to promote the chemical dispersion of oil slicks at sea.

Testing single-point ***nozzle systems***

Testing ***spray arms***



Deposition is presented as bars on a histogram and droplet size as a curve. The elements shown in blue are from tests carried out with water, and in yellow, the data from tests carried out with undiluted dispersant. The red horizontal lines represent the recommended upper and lower droplet size limits set out by the ASTM standard for single-point spray nozzles, namely 300 µm and 500 µm.

Boom mooring system trials on banks

By **Mikaël Laurent**, Analysis and Resources Department engineer at Cedre

During spill response operations, booms may be deployed to contain the spill and control its spread. Booms can also have a protective or deflective function, preventing sensitive sites against the pollution. When a boom is laid close to a shore, bank or quay, one or more mooring points are required to secure the boom ends.

Custom-made V-shaped mooring point

Claw anchor positioned in muddy substrate prior to trial

At certain sensitive sites (ports, harbour basins, water intakes, etc.), identified in spill response contingency plans, specific mooring points are permanently installed to protect the site.

However, as spills are inherently unpredictable, booms must often been deployed at sites that are not equipped with permanent mooring points. Mooring points must therefore be installed before laying the boom and removed at the end of response operations. These moorings must be able to be deployed quickly when an incident occurs. The need to install one or more robust mooring points is a recurring issue. Furthermore, these mooring points must also be suited to the diversity of possible substrates.

Booms are exposed to tensile stress due to wind (freeboard of the float), current (draught of the skirt) and agitation of the water body.

Claw anchor after trial in muddy substrate

∧ *Custom-made mooring composed of a wheel rim and reinforcing bars*

∧ *Ground anchor plate prior to trial*

∧ *Ground anchor plate after trial*

To simulate tensile stress, the mooring systems are first installed in the substrate selected for the study and subjected to a powerful, slow and gradually increasing tractive force generated by a vehicle with a telescopic arm. The mooring system is connected to the vehicle by a low-elasticity tow line manufactured specially for the trials. The line is fitted with a dynamometer to measure the tractive force applied at the point when the mooring system loses its hold or breaks. As far as possible, the measurement protocol was repeated three times for each trial to obtain a more representative mean value. Operational aspects, such as ease of installation, are also assessed during each trial.

The net force exerted at the mooring points can be considerable. In order to identify mooring systems that meet these requirements, from 2022 onwards several of Cedre's partners expressed the need to test such systems.

In September 2022, Cedre planned and conducted trials on five mooring systems in the natural environment at Aber Ildut (Finistère), aiming to assess these systems both in terms of their resistance in various muddy substrates and their ease of installation.

In 2023, new trials were carried out on the foreshore of Porsmoguer beach, in Plouarzel (Finistère), on mooring systems for use in sandy substrates. During these trials, 10 mooring systems were tested using a similar protocol to the 2022 trials, but this time installed in wet sand (lower foreshore) and dry sand (upper foreshore).

Finally, in 2024, another series of trials was performed on 23 manufactured and 4 custom-made mooring systems in grass-covered topsoil, representative of a vegetated bank.

The mooring systems tested ranged from simple wooden or metal stakes to more sophisticated devices such as auger anchors, toggles anchors and claw anchors. Custom-made mooring systems, some of which are used by the emergency services as makeshift moorings when no specialised equipment is available, were also tested.

All the data collected is compiled in an operational tool in the form of spreadsheets that can be used to select the mooring system best suited to a given substrate and the required resistance.

∧ *Screw anchor ripped out of the sand*

Development of a mobile spill monitoring solution

By **Thomas Le Bihan**, Research Department engineer at Cedre

The SAMi project, coordinated by Cedre in collaboration with IMT Mines Alès, ENSTA Bretagne and NKE Instrumentation, aims to develop a mobile analysis solution to respond to environmenmental emergencies by oil or chemical spills.

This project stemmed from a simple observation: when a spill occurs, it is difficult to obtain reliable real-time information on the nature and extent of the pollution. Yet this data is essential for emergency response teams and incident management centres, which must assess the situation quickly.

The idea was therefore to develop a solution that could be easily transported on site and used by non-specialists. This is how SAMi (Smart Case for Aquatic Monitoring and Intervention) came to be.

Prototype of the developed solution

The goal of the SAMi project is to develop an operational tool comprising three main modules:

- a sampling module, based on detailed protocols, designed in such a way that non-experts can get to grips with it quickly and efficiently;
- a water data analysis module, using a multi-parameter sensor to measure a wide range of environmental status indicators;
- an oil dispersibility test module, consisting in a simple test to determine whether an oil spill at sea can be chemically dispersed.

The equipment is used in conjunction with a tablet on which the SAMi application is installed. This application guides the user through the different stages of the process and generates a report for the incident management units. The protocols for each module are explained step by step, ensuring a reliable and high quality process, whatever the operator's expertise.

The collected data is transmitted by a device specially developed by ENSTA Bretagne, capable of operating via conventional communication networks or from so-called dead zones.

The SAMi project thus aims to improve crisis management by providing responders with a comprehensive, intuitive tool that enhances the reliability of sampling and analysis processes, while facilitating communication between teams in the field and in incident management units.

The project is currently in its final stages. The complete prototype, including the sampling, analysis and test equipment, as well as the terminal and data transmission system, was presented at Cedre's Technical Day on 20 November 2024.

Main screen of the SAMi application

Use of underwater drones for chemical spill response

By Laura Cotte, Research Department engineer at Cedre

Recent shipping accidents involving hazardous and noxious substances (HNS), such as the sinking of the *Grande America* in the Bay of Biscay in 2019 and of the barge *PAMPERO* carrying vinyl chloride in Isère, France in 2020, have highlighted the need to include chemical spills in emergency response preparedness.

To minimise these risks, the French authorities are introducing more stringent regulations, in particular with the recent ratification of the HNS Protocol, aimed at ensuring clearer visibility of French imports and exports of these substances. From an operational perspective, it is essential to have equipment suited to chemical response. This means conducting specific studies and tests to consolidate response procedures, while facilitating the choice of response strategies and equipment to be implemented.

The overall objective of this action is to rapidly strengthen emergency response capabilities for chemical spills both at sea and in inland waters. In particular, this involves defining procedures that cover chemical risks, more accurately assessing the performance and limits of use of response equipment through testing, and carrying out laboratory tests to characterise materials' resistance to aggressive chemicals. This action also includes the study of sampling and detection technologies, with a particular focus on drones (aerial, surface and underwater).

This year, we focused on assessing the sampling capabilities of an underwater drone: FIFISH V-EVO by QYSEA.

Tests performed

This tethered drone featuring a 4K camera is capable of diving to depths of up to 100 m with a 4-hour maximum dive time and can be fitted with a 500-mL piston syringe to take samples of polluted water.

FIFISH V-EVO underwater drone with its sampling syringe (500 mL)

Purchased by CEPPOL, the French Navy's centre of practical expertise in pollution response for the clearance diving unit GPD Atlantique, the FIFISH is mainly used for reconnaissance operations (leak from a wreck, search for ammunition, etc.). The water sampler has not yet been tested in operational conditions. The aim was therefore to check that the underwater drone's sampling system operates correctly in different environmental conditions.

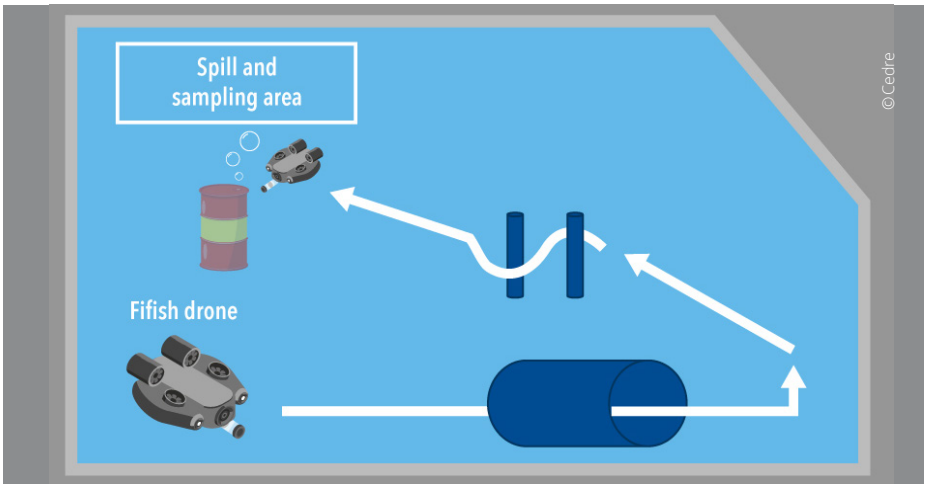
The tests were carried out in two phases :

- The first phase aimed to assess the performance of the sampling system for three experimental conditions (seawater, seawater with suspended solids and methanol diluted in seawater). The FIFISH was then deployed in Cedre's Polludrome© with a seawater configuration, in increasing current speeds. A current meter was used to assess the maximum current speed at which the FIFISH can operate;

- The second phase took place in Cedre's deep-water test tank. An agility course was designed to assess the drone's ability to navigate this course, which simulated travel through a wreck, as well as the reliability of its sampling system in the spill area (see diagram).

Watch the video of the FIFISH trials

Although the initial results point to certain improvements that could be made to the drone and its sampling syringe to meet the exact requirements in the event of a chemical spill, this technology was shown to be an asset for safely implementing response operations.



Agility course in Cedre's test tank for the FIFISH V-EVO drone

Assessment of litter on the French coastline under the Marine Strategy Framework Directive

By Camille Lacroix and Silvère André, Aquatic Litter Monitoring and Studies Department at Cedre

Marine litter is defined as any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment. It originates from human activities on the coast and in catchments, but can also be the result of offshore activities (fishing, pleasure boating, maritime transport, etc.). Marine litter affects all compartments of the marine environment. It is found on the coast, at the surface, in the water column and on the seabed, generating environmental, economic and social impacts.

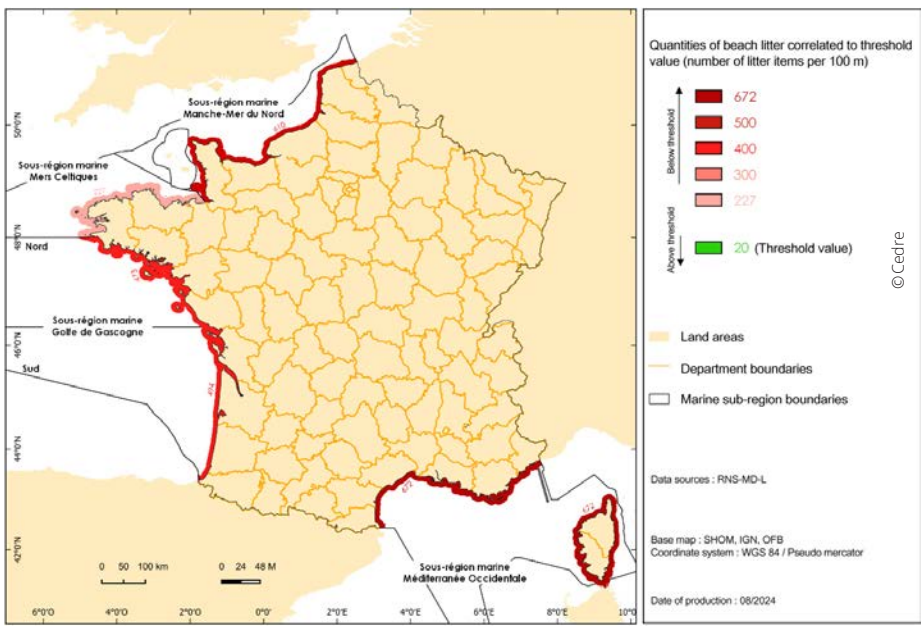
The Marine Strategy Framework Directive (MSFD) requires EU Member States to implement an ecosystem-based approach to the management of their marine environment in order to achieve or maintain good environmental status. Under the MSFD, Descriptor 10 on "Marine litter" for determining good environmental status is: "Properties and quantities of marine litter do not cause harm to the coastal and marine environment". Good environmental status is determined according to primary and secondary criteria, relating respectively to the pressure (litter or micro-litter) in different compartments of the marine environment (on the coastline, in the surface layer of the water column and in seabed sediment) and the impact, in particular ingestion or entanglement for marine animal species.

Since 2019, Cedre has taken on the role of national scientific and technical expert for the "Beach litter" aspect of MSFD Descriptor 10 "Marine litter", with the task of contributing to the development of monitoring indicators, associated protocols and the roll-out of monitoring networks (see article p 26). The data collected by the monitoring networks is used by Cedre to help to assess the pressure exerted by litter on the marine environment.

Marine Strategy Framework Directive (MSFD) logo

As part of the MSFD assessment of good ecological status in 2024, Cedre was commissioned by the French Environment Ministry's Water and Biodiversity Directorate (DEB) to conduct the assessment for the "Beach litter" indicator. This assessment, finalised at the end of 2023, was carried out over a 6-year period from 2015 to 2020 across the 4 French marine sub-regions: Channel/North Sea, Celtic Seas, Bay of Biscay and Western Mediterranean.

For this, Cedre drew on the data collected via the French national shoreline litter monitoring network (RNS-MD-L) which it coordinates (see article p 26). This network comprises over 50 survey sites, which are monitored by fully trained and funded local partner operators, situated all along the coastline of mainland France. The operators are responsible for obtaining data (sampling, counting and identification of macro-litter) and, for the most part, recording it in databases, while the rest of the analyses are carried out by Cedre.



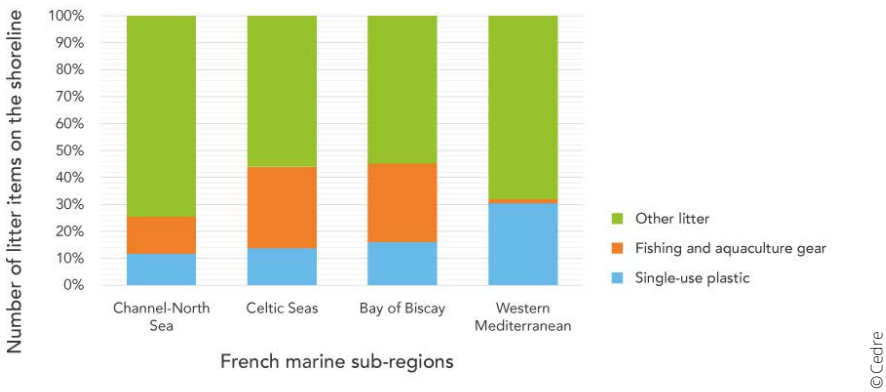
Assessment of the levels of beach litter found on the shores of the four French marine sub-regions for the period 2015-2020 correlated to the European threshold value of 20 litter items per 100 m

Litter on the French shoreline

The sites are surveyed 4 times a year, at specific times of the year corresponding to the different seasons (January, April, July and October), using a protocol applied by the operators and standardised at European level. The monitoring surveys involve collecting all visible litter > 5 mm on the surface of the sediment within a pre-defined 100 m-long section of beach, across the entire beach width from the water line to the backshore. Once the litter has been collected, it is sorted, characterised and counted based on a list defined at European level.

The data acquired is then analysed by Cedre by calculating the median total quantities of litter for each marine sub-region. These quantities are then compared with the threshold value of 20 litter items per 100 m adopted at European level as an indication of good ecological status for beach litter. The quantities of single-use plastics and fishing and aquaculture gear are also calculated and their evolution over time is determined in order to monitor the effectiveness of the measures set out in European Directive 2019/904 on the reduction of the impact of certain plastic products on the environment.

The assessment conducted by Cedre shows that for the "Beach litter" indicator, litter is abundant on the French coastline, in both the Channel/Atlantic and Mediterranean marine regions, with abundance values based on the median quantities of total litter ranging from 227 to 672 litter items per 100 m for the period 2018-2020 (see map). These values are far higher than the European threshold of 20 litter items per 100 m, indicating that good ecological status has not been achieved in any of the French marine sub-regions.



Total quantities of litter found on the French coastline during the period 2018-2020 (single-use plastics, fishing and aquaculture gear, other litter)

Among the litter found on the French coastline, single-use plastics account for between 12% and 31% and fishing and aquaculture gear for between 2% and 30%, within the different marine sub-regions.

The evolution over time of the quantities of total litter, plastics, single-use plastics and fishing and aquaculture gear could only be analysed for the Celtic Seas and the Western Mediterranean marine sub-regions for the period 2015-2020 due to insufficient data for the other marine sub-regions. In the Western Mediterranean, significant decreases were observed for the four litter categories studied, indicating a drop in pollution levels over the period 2015-2020, while for the Celtic Seas marine sub-region, no significant trend was observed, indicating that pollution levels remained stable over the study period.

These results show that current efforts to reduce the pressure exerted by litter on French marine waters must be pursued.

All the results of the assessment for Descriptor 10" litter" outlined and available in a report jointly produced by Cedre, Ifremer and OFB entitled *"Évaluation du descripteur 10 "Déchets marins" en France métropolitaine. Rapport scientifique pour l'évaluation 2024 au titre de la DCSMM".*

Find out more about the Marine Strategy Framework Directive

Cooperation agreement signed with OFB

At the beginning of September, the French Biodiversity Agency (OFB) and Cedre signed a cooperation agreement as part of their joint public service missions, with a particular focus on the monitoring of litter on the shoreline and from drainage basins and the assessment of the ecological status of the marine environment, within the framework of national (marine protected area management) and international (Marine Strategy Framework Directive, Regional Seas Conventions). This cooperation aims to combine the skills and knowledge of the two organisations in order to carry out relevant, operational monitoring and assessments of the ecological status of French marine waters.

Partnership agreement signed with Vigipol

In early October, Vigipol and Cedre signed a partnership agreement primarily intended to:

- enhance knowledge of accidental pollution along the coastline of municipalities;
- share expertise and information;
- prepare stakeholders for pollution at sea and on the coast;
- raise awareness of pollution risks among local councillors, council employees and the general public.

Collaboration agreement signed with LPO

In June, the bird protection organisation LPO *(Ligue pour la Protection des Oiseaux)* and Cedre renewed the framework agreement between the two associations. The areas of collaboration include:

- emergency situations, such as when wildlife contaminated by oil or chemicals reaches the coast;
- spill response preparedness, in particular by developing specific documentation on the rehabilitation of wildlife and birds;
- scientific and technical collaboration on topics of shared interest (in particular plastic litter in aquatic environments);
- raising awareness of pollution risks among local councillors, council employees and the general public;
- training
- the outreach of the two organisations

Partnership agreement signed with Natural Resources Canada

In April, a memorandum of understanding was signed by Natural Resources Canada and Cedre with a view to promoting cooperative research into spills of oil and HNS in the environment.

This cooperation is set to focus on the fate and behaviour of these pollutants in the environment in order to improve:

- knowledge of their effectiveness and impacts;
- spill detection and monitoring;
- understanding of their biological impacts;
- the physical recovery of pollutants, as well as contingency planning and decision-making.

Tackling plastic litter in urban networks for local authorities and associated stakeholders in the Loire-Brittany catchment

By **Marine Paul**, Litter Monitoring and Studies Department engineer at Cedre

RÉSEAU REGARD
Agir contre les déchets dans les réseaux urbains

Plastic pollution is a major issue that raises many challenges on a global scale. This form of pollution particularly affects aquatic environments, especially watercourses and the marine environment, as shown by the results obtained by France's national monitoring networks coordinated by Cedre (see article p 26).

Litter in urban networks

Within this landscape, urban water networks have been identified as litter transfer routes.

At national level in France, litter in wastewater and stormwater systems is the focus of several action plans led by France's Environment Ministry, in particular the Biodiversity Plan and the associated "Zero Plastic Waste at Sea" action plan implemented with the support of the French Water Agencies.

At a more local level, local authorities and network operators are confronted with operating constraints and uncertainties over the best strategy and methodologies to be applied, roles and responsibilities, and return on investment.

Against this backdrop, in early 2024, OiEau and Cedre joined forces to create the REGARD Network. This network, co-funded by the Loire-Brittany Water Agency, provides expertise and support for action to reduce plastic macro-litter in urban networks, for local authorities and associated stakeholders in the Loire-Brittany area. The network will strive to foster innovative action, experience sharing and good practice. Local authorities and operators of urban networks Loire-Brittany area can thus benefit from independent support and resources to develop an effective, ongoing strategy to combat plastic macro-litter and reduce transfers to aquatic environments.

This support comprises:

- access to the complementary expertise of Cedre and OiEau;
- assessments of plastic pollution and potential hotspots in order to identify priority actions;
- provision of model documents and good practice guides;
- recommendations for equipment purchases;
- proposal of indicators and monitoring methods to assess the effectiveness of the actions implemented;
- information and training on the issues surrounding plastic pollution;
- connections with a network of managers, stakeholders and experts to benefit from their feedback and expertise;
- support in promoting and communicating about actions implemented.

Calling all local authorities! Interested in receiving support while helping to boost national expertise in tackling macro-litter in urban networks?

Get in touch: contact@reseau-regard.org

2023 review of the national monitoring networks for litter on the shoreline and from drainage basins

By **Kevin Tallec, Marine Paul and Silvère André**, Litter Monitoring and Studies Department engineers at Cedre

At the request of the French Environment Ministry, Cedre coordinates three national aquatic litter monitoring networks in France:

1. The French national shoreline litter monitoring network (RNS-MD-L);

2. The French national network for the monitoring of mesoplastics and large microplastics on beaches (RNS-mP-P);

3. The French national monitoring network for litter from drainage basins (RNS-MD-BH).

These networks provide input for various public policies such as the Marine Strategy Framework Directive*, the OSPAR Convention* and the Barcelona Convention*. They monitor the level of pollution in aquatic environments by human-created litter and assess the effectiveness of action programmes implemented in France.

In 2023, the three networks monitored 96 survey sites around mainland France, mobilising 53 local partner operators, trained by Cedre in pan-European harmonised protocols. The 2023 results show a median abundance of 309 macro-litter items per 100 m of coastline and 329 macro-litter items per 100 m of river bank, over 85% of which is plastic. For mesoplastics (between 5 mm and 2.5 cm) and large microplastics (between 1 and 5 mm), the analyses show median abundances of 800 mesoplastic items per 100 m of beach and 1,470 large microplastic items per 100 m, including 380 plastic pellets per 100 m.

These results substantiate the omnipresence and abundance of litter, particularly plastics, on the shoreline and river banks in mainland France, highlighting the importance of pursuing and scaling up litter reduction actions.

7 new sites added in 2024:

Cabourg (Calvados), Carantec (Finistère), Jard-sur-Mer (Vendée), Yainville (Seine-Maritime), Basse Indre (Loire-Atlantique), Parempuyre (Gironde), Palasca (Haute-Corse)

Characterisation of litter collected on a beach in Guadeloupe

In French overseas territories, there is currently no regulatory framework requiring marine litter to be monitored along their coasts. Yet, their coasts are also affected by litter. Since 2023, Cedre has been conducting a feasibility study to extend litter monitoring to the coasts of French overseas territories. With this extension, data could be acquired from more than 26 sites across different territories.

? SAY WHAT

***Marine Strategy Framework Directive:**
Adopted in 2008, the aim of this European directive is to maintain or restore the good environmental status of marine ecosystems, while enabling future generations to use the sea in a sustainable manner.

***OSPAR Convention:**
Adopted in 1992, the Convention for the Protection of the Marine Environment of the North-East Atlantic, known as the OSPAR Convention, aims to prevent and eliminate marine pollution resulting from human activities in the North-East Atlantic in order to protect its ecosystems and biological diversity.

***Barcelona Convention:**
Adopted in 1976, the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean, often referred to as the Barcelona Convention, aims to prevent and abate marine pollution from ships, aircraft and land-based sources in the Mediterranean Sea.

Developing new training tools

By **Klervi Le Failler-Tromeur**, Studies and Training Department engineer at Cedre.

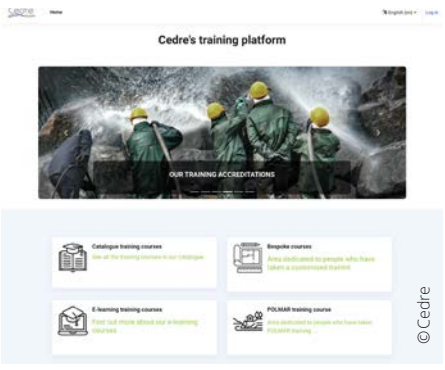
19.6/20

Average satisfaction score for the "Tactic Spill" game since its creation in 2020

New training tools play a pivotal role in enhancing and updating training methods. Cedre's commitment to continuous improvement together with the change management process triggered after achieving Qualiopi certification and Nautical Institute accreditation in 2020 are driving the organisation towards more diversified training methods, bolstered by more agile and interactive approaches.

Dialogue and sharing

Before, during and after training courses, discussions both between trainees and between trainees and trainers are strongly encouraged. For this, an online platform has been set up, including a mutual help forum between trainees and a question and answer section with the trainers.



Cedre's online training platform

Check out our online training platform at elearning.cedre.fr

Accessibility and flexibility

With new training methods, it is easier to access resources. E-learning courses have been added to our training catalogue, offering trainees the chance to lay the groundwork before taking an in-person course, to take a refresher course to brush up on previously acquired knowledge, or to complete modules on specific topics independently and asynchronously, working at their own pace and wherever suits them.

New online training module

Autonomy and assessment

In addition to interactive quizzes and applied exercises, for several years Cedre has been designing and developing tabletop serious games in which trainees can apply and consolidate their new-found knowledge. Through this so-called edutainment approach, many sometimes complex concepts can be presented in an entertaining way. Players must navigate their way though the game, make decisions and face up to their responsibilities based on fictitious, interactive scenarios. With such methods, the acquisition of skills can be evaluated in a continuous, dynamic and participatory manner.

Example of a serious game

In short:

Learning, understanding, doing... A variety of teaching methods are used to boost the learning process throughout the courses: theory lectures delivered either in-person or virtually, practical sessions with equipment deployment and release of a pollutant or simulant, case studies of past incidents, tutorials, tabletop exercises, interactive quizzes and serious games...

The diverse spectrum of teaching methods brought into play is essential to boost the learning process and offers numerous advantages for Cedre's training courses. The integration of new teaching methods has already delivered positive results and is appreciated by trainers and trainees alike.

Cedre is on track to continue to develop and offer new teaching methods for both its standard and bespoke training courses, whether run virtually or in-person, in the classroom or through practical sessions, in order to continue to best meet the needs of spill response players and facilitate knowledge uptake.

In the spotlight: Cedre at national events

By **Anne Ily**, Information and Communication Department Manager at Cedre

General public events

Cedre has been involved in numerous recent emblematic events, from maritime and science festivals to European Researchers' Night, combining maritime heritage, science and the local area. At these general public events, Cedre promoted its missions and actions, tailoring its messages to the different audiences.

The focus was on showcasing the world of spill preparedness and response through fun, educational activities, suitable for young and young at heart, to raise awareness of pollution by oil, chemicals and aquatic litter. Cedre's engineers were in the spotlight to present the different types of pollutants, simulate their behaviour in aquatic and marine environments and outline the equipment and techniques deployed to effectively respond to these different types of pollution.

Science festival

Researchers' Night

Brest maritime festival

National Firefighters Congress

As an organisation involved in civil protection, Cedre took part in France's 130th National Firefighters Congress. This congress, placed under the patronage of the *Fédération nationale des sapeurs-pompiers de France,* brought together all of the sector's professionals and institutions, making it one of the largest professional events in France!

Cedre was able to talk to many of the different fire brigades in attendance and remind them of our 24/7 emergency response service, our training courses and our documentation centre, and presented its work on chemical risks and new shipping fuels in the event of a spill in inland or marine waters.

National Firefighters Congress

Sea Tech Week®

Sea Tech Week® is an international event held in Brest (Finistère) from 15 to 17 October 2024. Sea Tech Week® is an international event organised by the *Technopôle Brest-Iroise through Campus mondial de la mer.* This year's edition focused on maritime safety and security and showcased Ireland as its featured country.

Sea Tech Week®

In addition to running an exhibition stand, Cedre contributed to a conference on maritime safety and a Franco-Malaysian workshop on ocean preservation and facilitated the European SaferSEA project workshop focusing on new maritime fuels.

EXCERPT FROM TECHNICAL NEWSLETTER N°55

Riverbank erosion and landslide: pollution in the Amazon basin (OCP pipeline, Ecuador)

By **Ivan Calvez**, Research Department engineer at Cedre

On 28 January 2022, near the municipality of Piedra Fina (Ecuador), heavy rainfall caused a landslide above the banks of the Coca River (a tributary of the Napo River which in turn flows into the Amazon River). During this landslide, a rock 2 metres in diameter struck and ruptured a pipeline operated by *Oleoductos de Crudos Pesados (OCP) Ecuador.*

View of the breach in the pipeline (left); Soil and vegetation in the ravine sprayed by the pressurised oil spurting from the pipeline (right)

Aerial view of an oil accumulation point on the Coca River

The event occurred in an area already suffering from severe soil erosion due to the construction of upstream structures which, in 2020, had already caused the banks of the Coca River to collapse and had led to the rupture of two pipelines in the Trans-Ecuadorian Pipeline System *(Sistema de Oleoducto Trans-Ecuatoriano SOTE)* (see Inland Waters Technical Newsletter n°30).

This time, more than 1,000 m^3 of heavy crude oil sprayed out onto the surrounding soil and vegetation, before running down the ravine towards the riverbed. After pumping had been suspended, and while repair operations were launched, OCP commissioned three specialist companies to carry out clean-up operations, both on the watercourse and between it and the pipeline.

The operator indicated that the emergency containment measures implemented (earthen bunds; digging of retention pits; laying of sandbags, sorbents, containment booms, etc.) had, within two days of the spill, successfully contained most of the oil at seven main collection points, upstream of the spill location.

On 3 February 2022, OCP announced that it had collected and reinjected into the pipeline around 850 m^3 of oil, and that it was focusing its efforts on recovering "traces" of crude oil in the river, without disclosing details of the volumes involved, while reports of oil visible on the banks of the Coca River were received from neighbouring Indian communities.

Crude oil containment/collection using sorbent booms in secondary drainage pits along the ravine (top); pumping (vacuum truck) to a collection point/pit (bottom).

Digging drainage pits (left) and trenches (centre), using heavy machinery, as an emergency measure to reduce the spread of the oil from the breach in the pipeline; construction of earthen bunds at an outflow in the Coca River (right).

Cedre, a partner in European projects

MANIFESTS GENIUS

Project coordinator

2024 - 2025

Co-funded by the European Union

From gases and evaporators risk assessment towards an Integrated management of sea and land pollution incidents

Project partner

SAFERSEA

Interreg Atlantic Area — Co-funded by the European Union

2023 - 2026

Contribute to the development of a safer, eco-friendly maritime sector and to provide maritime stakeholders with off-the-shelf solutions to support their green transition

IMAROS 2

Co-funded by the European Union

2024 - 2025

Impacts and response options regarding low sulphur marine fuel oil spills

TREASURE

Interreg North Sea — Co-funded by the European Union

2023 - 2026

Targeting the reduction of plastic Outflow into the North Sea

FREE LITTER AT

Interreg Atlantic Area — Co-funded by the European Union

2024 - 2025

Advancing towards litter-free Atlantic coastal communities by preventing and reducing macro and micro litter

IBAIA

Co-funded by the European Union

2022 - 2026

Innovative environmental multisensing for waterbody quality monitoring and remediation assessment

RAVEN

Co-funded by the European Union

2024 - 2025

Developing ultra high resolution atmospheric sensors

Find out about the other projects in which Cedre is or has been a partner at www.cedre.fr

TRAINING CATALOGUE

Our 2025 training catalogue is now available!

Every year Cedre trains over 1,400 people across the globe.

Our commitment
We are committed to sharing the expertise we have built over the last 45 years by providing operational training to all spill response stakeholders (public administrations, local authorities, private companies, both in France and worldwide).

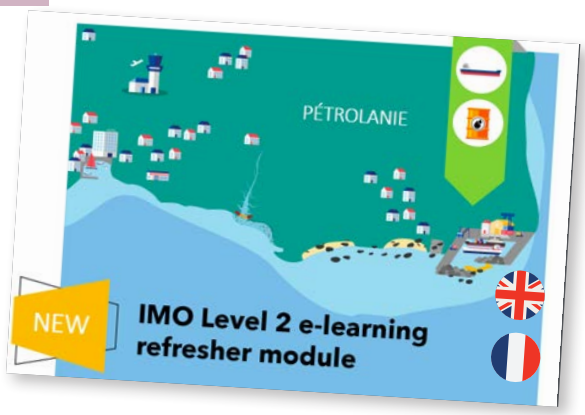
Access the catalogue

For further information, please contact us: formation@cedre.fr

REFRESHER COURSE

Check out our IMO/OPRC Level 2 equivalent E-learning refresher course on "**Oil spill response at sea and on the shoreline**"!
Designed for trainees who have already taken Cedre's initial in-person training course, this refresher course reviews all the topics addressed during the initial training course and offers trainees that chance to refresh their skills and knowledge in order to update their theoretical knowledge of response strategies and techniques in case of oil spills at sea and on the shoreline.

Register via our online training platform elearning.cedre.fr



DATES FOR THE DIARY

Cedre webinars

- **January 2025**
  National litter monitoring networks review
- **March 2025**
  The SAMi sampling case
- **June 2025**
  Plastic pellets
- **September 2025**
  Port preparedness reviews
- **November 2025**
  Equipment testing

Cedre Information Day

Topic
Response in ports and new risks related to offshore renewable energy

Date
Thursday 20 March 2025

Cedre AT A GLANCE

Based in BREST for over **45 years**

50 people

€5.5 million budget

60 training courses annually

60 contingency plans delivered in the past 10 years

20 countries visited each year

200 emergency activations each year

75 oils studied in 12 years

Recognised documentary resource centre with **22,000** references

20+ multipartner projects in 10 years

INTERNATIONAL EXPERTS IN SPILL PREPAREDNESS AND RESPONSE

Marine waters / Inland waters
Oil / Chemicals / Microplastics / Litter
Authorities / Private organisations

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

INTERNATIONAL SCOPE

GETTING TO Cedre

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Centre of Documentation,
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