European Maritime Safety Agency

CLEANSEANET SERVICE CATALOGUE

EDITION: 2023

EMSA

CLEANSEANET SERVICE CATALOGUE

1 INTRODUCTION

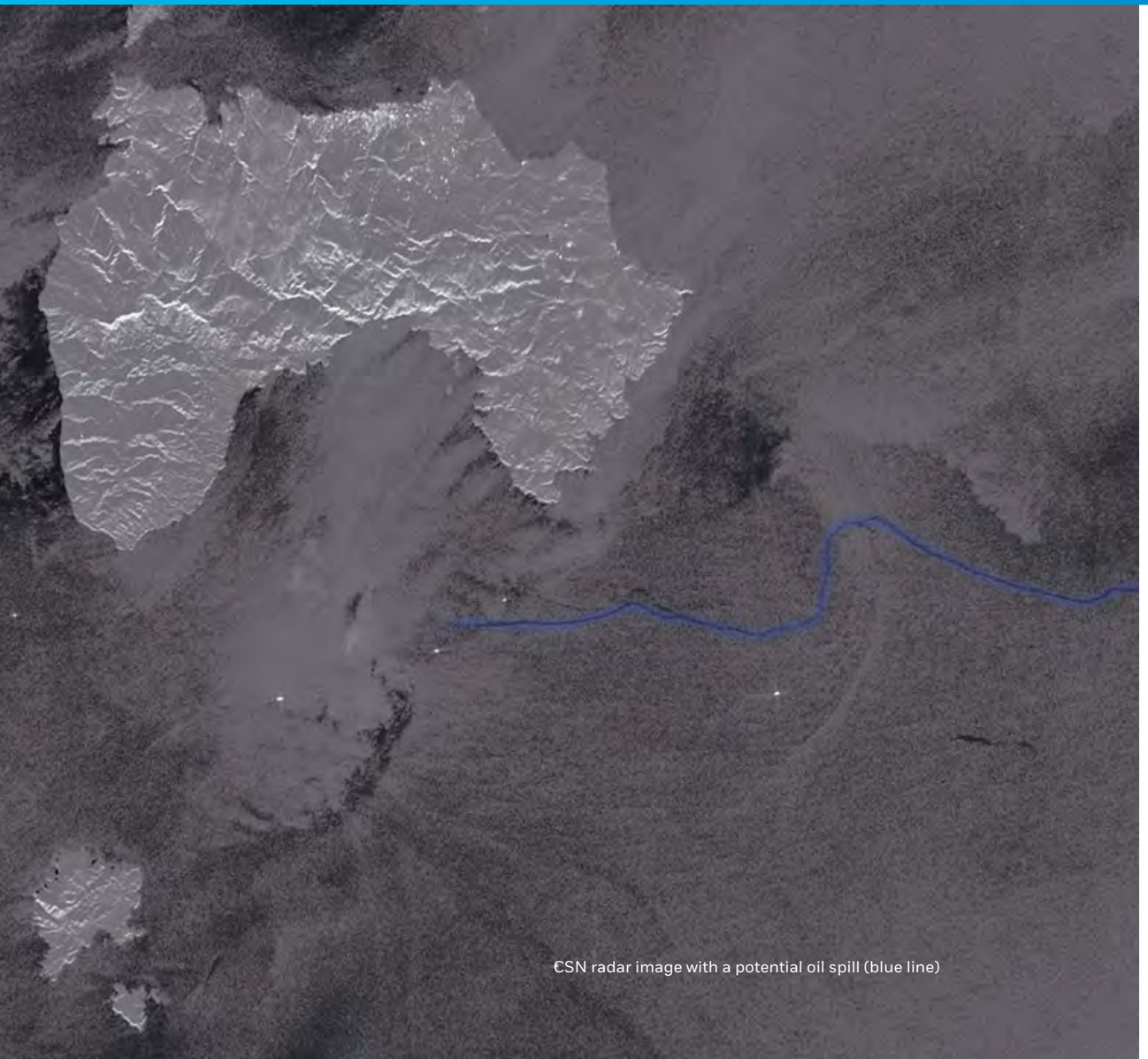
In September 2005, the European Parliament and the Council adopted Directive 2005/35/EC (since amended by Directive 2009/123/EC) on ship-source pollution and the introduction of penalties, including criminal penalties, for pollution offences. The Directive tasks EMSA to *"work with the Member States in developing technical solutions and providing technical assistance in actions such as tracing discharges by satellite monitoring and surveillance."*

To comply with this task, EMSA developed CleanSeaNet (CSN), a pan-European satellite based oil spill monitoring service, operated by the Agency since April 2007. Following EMSA's founding regulation revision in 2013, CleanSeaNet may also be used to monitor spills from offshore installations.

CSN is the European satellite-based oil spill and vessel detection service that offers assistance to participating States for the following activities:

- Detection of oil pollution on the sea surface and contributing to the identification of potential polluters.
- Monitoring accidental pollution during emergencies.
- Providing support to oil spill surveillance operations and exercises.

The CSN service is based on the ordering of Synthetic Aperture Radar (SAR) satellite images, providing worldwide coverage, night and day, of maritime areas, independent of fog and cloud cover. Data from these satellites is processed into images and analysed for oil spill, vessel detection and meteorological variables. The information retrieved includes, among others: spill location; spill area and length; the confidence level of the detection; and supporting information on the potential source of the spill (i.e., detection of vessels and oil and gas installations). Optical satellite images can also be acquired upon request, depending on the situation and user need, and usually in support to large accidental spills.



CSN radar image with a potential oil spill (blue line)

2 CLEANSEANET SERVICE

2.1 CleanSeaNet Community

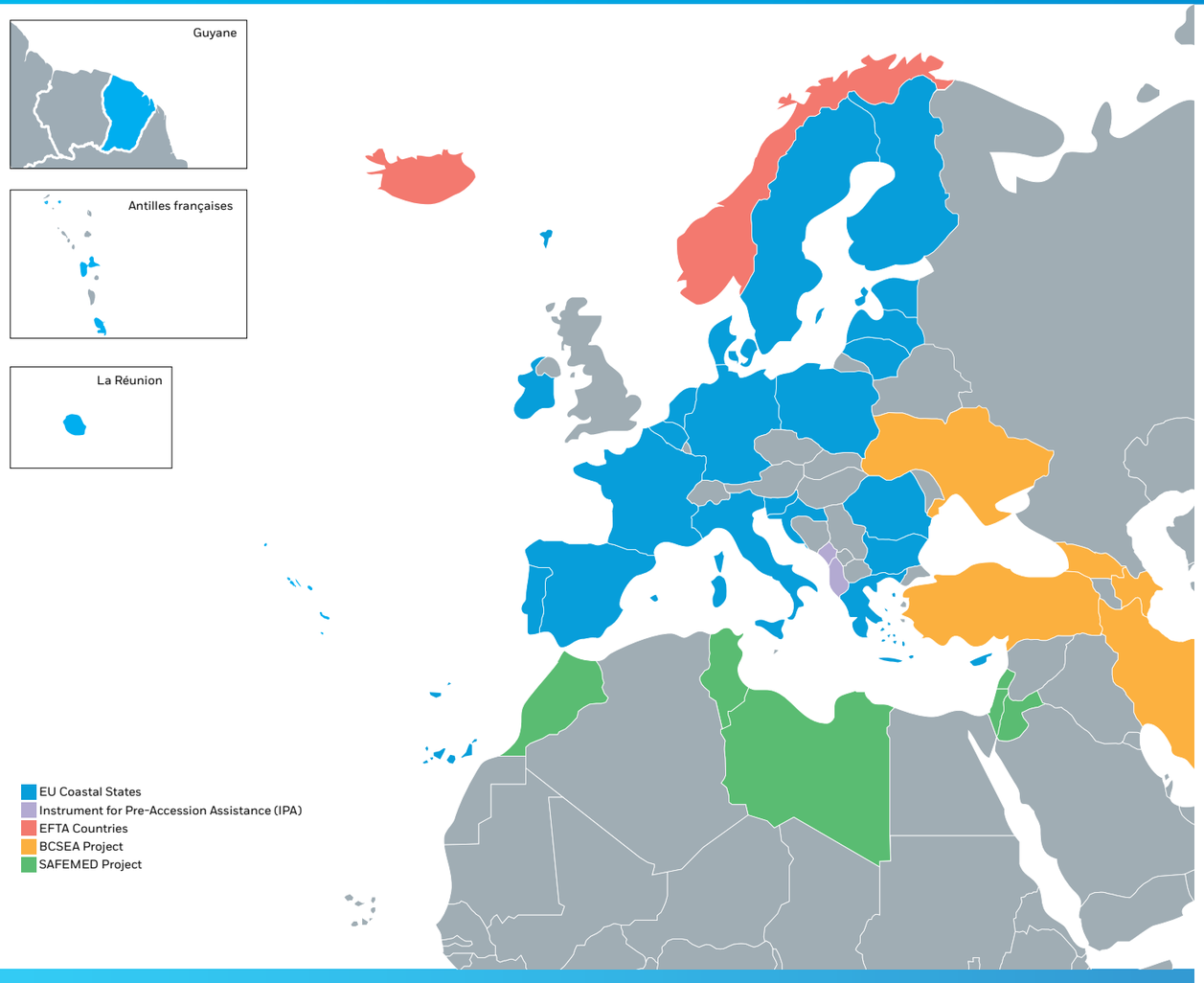
The CSN community includes more than 680 operational users from national authorities responsible for at-sea oil pollution monitoring and operational planning, preparedness, and response. These include maritime authorities (e.g., Navy, Coast Guard), maritime rescue coordination centres (MRCCs) and Environmental Agencies.

As a pre-condition for using the service, the National Competent Authority (NCA) in the Participating State and EMSA sign the CSN Conditions of Use. This agreement sets out the roles and responsibilities of both parties and defines the administrative point of contact towards EMSA for any activity related to the implementation, use, or update of the service.

The NCA is also responsible for authorising the access of other national public organisations to the CSN service.

The service is provided to the Coastal EU Members States, their overseas territories and EFTA countries. It is also offered on a project-based basis to European Neighbourhood (ENP) countries under the Instrument for Pre-Accession Assistance (IPA), SAFEMED and the Black and Caspian Sea projects.

CSN also provides technical and operational support to regional agreements dealing with the protection of the marine environment in the various sea basins around EU waters, such as the Bonn Agreement and the Helsinki Convention.



The CleanSeaNet community

2.2 User Group

The service is governed by the CSN User Group, composed of delegations from the signatory countries to the CSN Conditions of Use, and EMSA representatives

The Agency organises annual CSN User Group meetings to establish strong links with the user community in the Coastal States and to continuously improve the service operational performance.

The objectives of the User Group are to:

- Exchange information, operational experience and lessons learned between the participating Coastal States.
- Foster the integration of CSN in the response chain for illegal discharges and accidental pollution.
- Perform regular assessments of the service.
- Identify elements for improvement and draft the medium and long-term goals of the service.

EMSA's headquarters in Lisbon.

EMSA hosted the 22nd CleanSeaNet User Group on 9 March 2023.

3 HOW CLEANSEANET SERVICE WORKS

3.1 Access to CleanSeaNet

The service is provided through a single web-based entry point called the SafeSeaNet Ecosystem Graphical User Interface (SEG). SEG enables users to access and visualise all information, which includes specific data sets, and access to other global data layers as maritime maps, meteorological information, and open-source data.

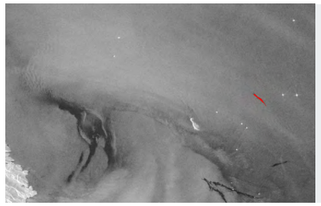
CleanSeaNet information is made available within 20 minutes of satellite image acquisition, supporting the national decision-making processes on pollution response and follow up to possible illegal discharges.

3.2 Requests from users and coverage requirements

CSN routine monitoring is provided based on the coverage requirements pre-defined by the Coastal States, comprising the geographic areas of interest and the number of satellite images to be acquired monthly.

Besides routine monitoring, the users may also request additional satellite images covering a specific area of interest (e.g., to monitor a ship-to-ship transfer).

The service may also be activated during emergencies to monitor the spill area over an extended period, capturing the evolution of the spill and supporting response and recovery operations not only with SAR imagery, but also with higher resolution products obtained from optical imagery.



Greece 28 August 2021 - The cargo tanker Sea Bird collided with the rocky islet of Karavi, sinking immediately. To support the emergency response, Greek authorities activated EMSA's CSN satellite service. Sixteen synthetic aperture radar (SAR) images and one optical image were delivered.
CleanSeaNet products ©European Maritime Safety Agency, contains modified Copernicus Sentinel-1 data, 2021

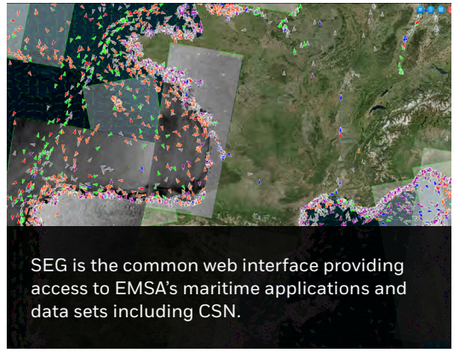
3.3 Satellite image planning and ordering

In order to plan and order satellite images in the most efficient way, EMSA's planning team follows a defined procedure which includes the following steps:

- Determine user requirements in terms of satellite-based monitoring and complementary data and evaluate the most appropriate combination of earth observation products, such as the type of sensor, resolution, and acquisition opportunities, in accordance with the user needs. Uploading planning files in EMSA's Earth Observation Data Centre (EODC) which is the reference tool used for planning and ordering.
- Selecting the services according to the user requests, operational needs, and the legal rules of the contracts signed with the service providers. At this point, it is important to identify potential or existing limitations such as conflicts with other services and the unavailability of satellites/ ground stations.

  Uploading planning files in EMSA's Earth Observation Data Centre (EODC), which is the reference tool used for planning and ordering.

Each acquisition in the task form is referenced by an order ID (Service ID) which is unique and enables the traceability of each service.



SEG is the common web interface providing access to EMSA's maritime applications and data sets including CSN.

Santa Maria ground station located in the mid-Atlantic in the Azores - Portugal.

3.4 Role of industry

CSN relies on contracts that EMSA has with licence providers, operating the satellites and providing the licences to use the satellite data and service providers providing ground stations, data processing and value-adding services based on the satellite products.

CSN currently uses data from five different synthetic aperture radar (SAR) missions.

Currently, more than 70% of CSN images are acquired by the Sentinel-1 mission.

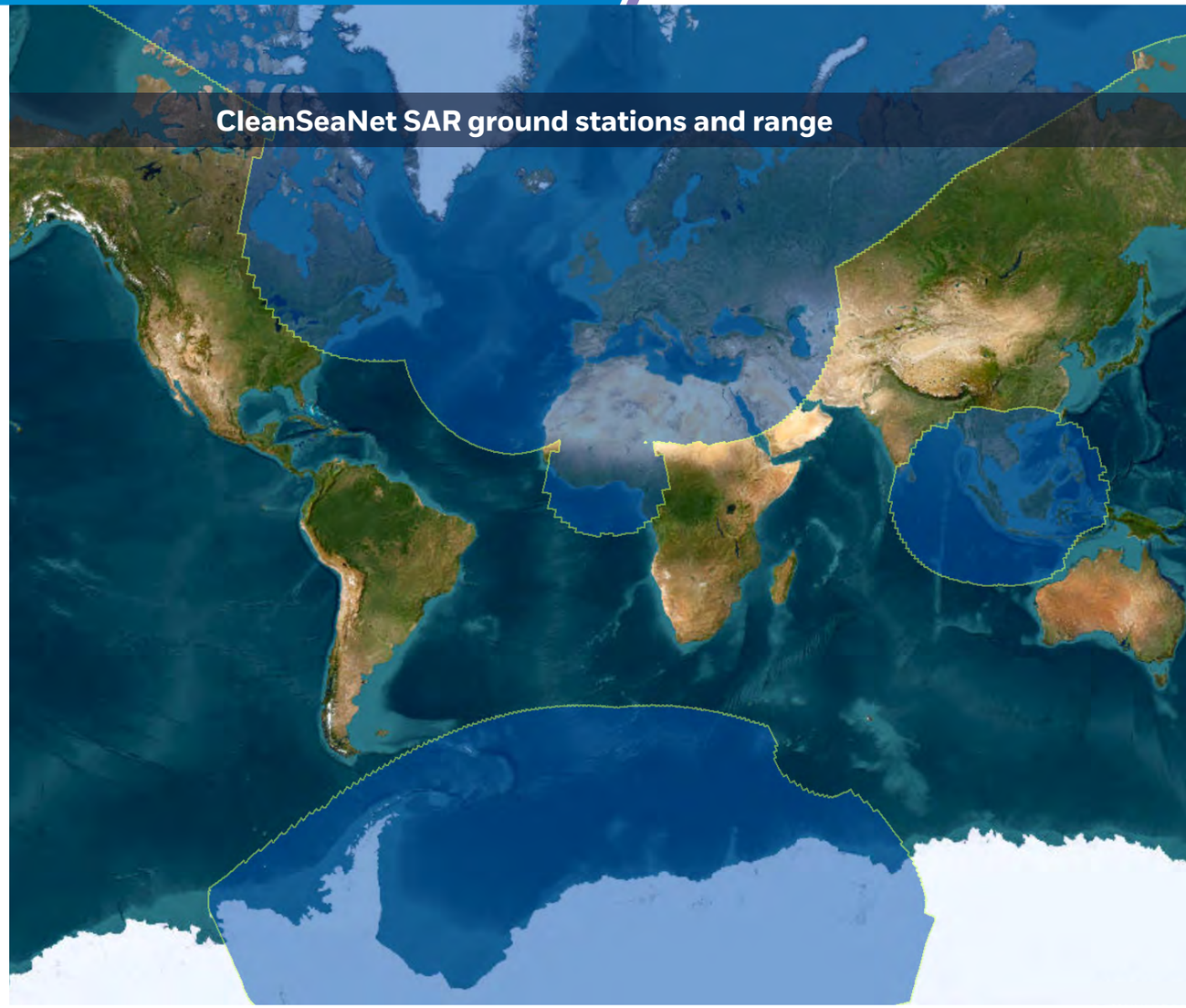
In terms of emergency support, EMSA also has access to a wide range of very high-resolution optical satellites.

These satellites are used to provide detailed information on the impact of the pollution event, and support response operations.

Data from SAR satellites is acquired and processed in quasi real-time (QRT) by a set of ground stations and then transferred to the EMSA Earth Observation Data Centre (EODC) for further value-adding and distribution to end-users.

The ground stations currently contracted by EMSA are in:

- Toulouse and Brest (France),
- Athens and Fthiotida (Greece),
- Happy Valley (Canada),
- Matera (Italy),
- Tromsø and Svalbard (Norway),
- Puertollano (Spain),
- Troll (Antarctic region),
- Santa Maria (Azores, Portugal),
- Singapore,
- Accra (Ghana).

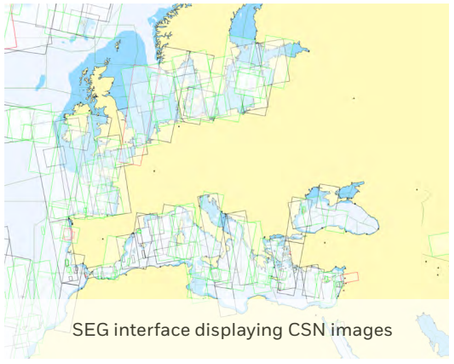


3.5 Service delivery

After a satellite acquisition, operators with expertise from the service providers' teams analyse the image together with supporting information to identify possible pollutions at sea, determine the likelihood of oil on the sea surface, and assist in identifying the source of the pollution.

The CSN service implemented by EMSA offers a comprehensive range of information, including location information on oil spills and related parameters such as area, width, length, and confidence level of detection, potential polluter identification, and detection of vessels, as well as wind and swell data obtained from SAR images. Additionally, CSN combines this information extracted from satellite images with EMSA's specific datasets, which include vessel traffic data from sources like terrestrial AIS, satellite AIS, and LRIT.

Further to the oil spill detection and vessel detection services mentioned above, CSN also offers a feature detection service to detect features of interest at sea, and an activity detection service that reports activities of interest at sea.



SEG interface displaying CSN images

3.6 Alerting Rules

In case of a possible oil spill being detected in the alert area of a Coastal State (i.e., the geographic area predefined by the State and configured in EMSA's data centre), a CSN alert report is automatically delivered to the related country in quasi real-time (usually less than 20 minutes after the satellite pass).

Based on the rules defined by the Coastal States, the level of the alert can be Red, Yellow, or Green, based on the combination of three factors:

- **Likelihood** – the likelihood of the reported spill being oil.
- **Culprit** – the probability that a clear culprit can be identified.
- **Impact** – level of potential damage to the environment.

The alert report also includes a set of information about the possible spill, such as the centre position of the possible spill (latitude and longitude), area, length, width, detection confidence level and information about the potential polluter(s) such as IMO and MMSI and the vessel position. Meteorological and ocean data is also included in the alert report.

3.7 Verification activities and feedback

By signing the CSN Conditions of Use, the Coastal States agree to follow up on the possible oil spills detected by CSN as extensively as possible.

Therefore, following receipt of an alert report, the national authorities shall validate the information by using their surveillance means for verification on-site (patrol vessels, helicopters, amongst others), and inspecting the vessel identified as a polluter. The timeliness of the verification activities is critical, as within a few hours spills may weather out, and it is important to collect actual evidence, or even catch polluters in the act.

Feedback is essential for the quality monitoring of the service, but most importantly to understand the impact that CSN has in Member States' activities and its overall contribution to the reduction of illegal discharges at sea. Therefore, Coastal States shall provide information regarding verification of the possible oil spills and related results through EMSA's web interface.

The provision of feedback from the users contributes to a continuous service improvement, an understanding of CSN's impact concerning oil spill discharges at sea and an overall assessment of its long-term deterrent effect on polluters.

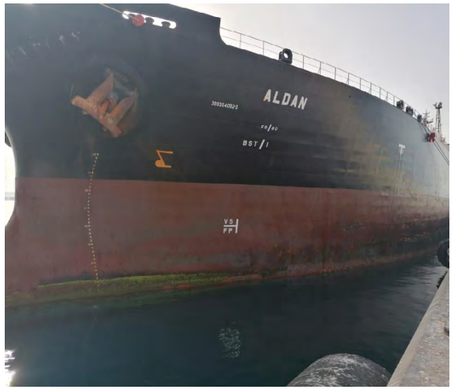
3.8 Prosecution of pollution offenses

Prosecuting criminal offences for environmental crimes requires robust evidence connecting a culprit to the crime. In this regard, the role of satellite surveillance to detect oil spills and identify polluters is crucial, as it helps identifying the possible cases of marine pollution.

CSN has led to several prosecutions using satellite imagery combined with other evidence, in which fines were imposed.

In this respect, it is deemed important that Coastal States inform EMSA of any enforcement measures taken against potential polluters detected and identified using the CSN service. The Agency is seeking to develop activities with enforcement authorities to promote an effective follow-up to CSN detections.

In June 2021, a CleanSeaNet alert with a possible oil pollution and an identified polluting vessel ALDAN was sent to the Spanish Maritime Search and Rescue Agency (SASEMAR). The vessel was contacted and airplane SASEMAR 103 mobilised. Its reports confirmed the pollution. The vessel was detained for an inspection and a fine was issued.

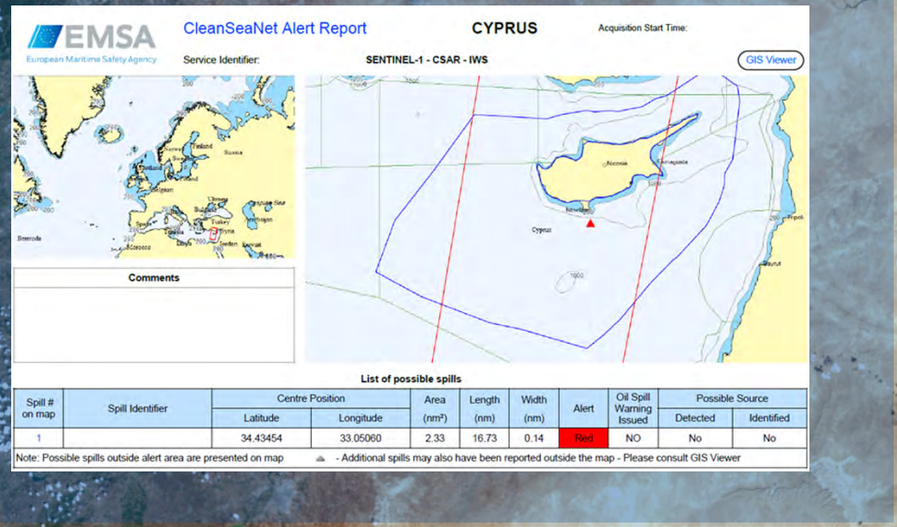


Prosecution case studies

Cyprus

In early 2020, following CSN Alert Reports, the Cypriot authorities positively identified two vessels as the source of oil spills detected in the country's Economic Exclusive Zone (EEZ). The crews, who had transmitted their position during the discharges, cooperated when approached by the authorities.

The country's maritime authority prosecuted the vessel owners and applied a fine of 5,000 EUR in both cases.



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CleanSeaNet Alert Report — CYPRUS — Acquisition Start Time:

Service Identifier: SENTINEL-1 - CSAR - IWS — GIS Viewer

Comments

List of possible spills

Spill # on map	Spill Identifier	Centre Position		Area	Length	Width	Alert	Oil Spill Warning Issued	Possible Source	
		Latitude	Longitude	(nm²)	(nm)	(nm)			Detected	Identified
1		34.43454	33.05060	2.33	16.73	0.14	Red	NO	No	No

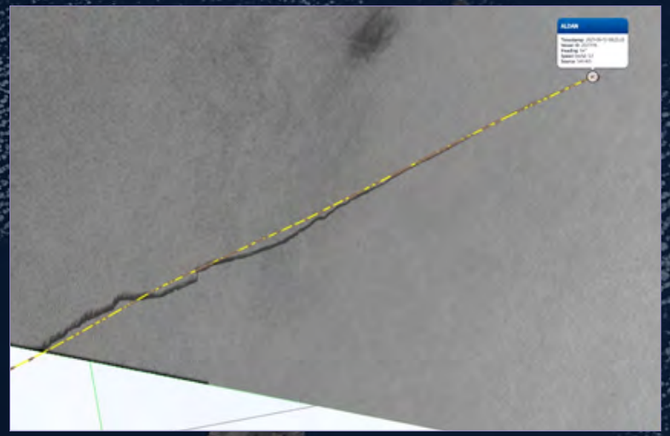
Note: Possible spills outside alert area are presented on map - Additional spills may also have been reported outside the map - Please consult GIS Viewer

Spain

On 10 June 2021, an oil spill was detected in the Atlantic Ocean, northwest of the Canary Islands. Combining satellite data with additional information from EMSA's systems, the authorities identified a tanker as the possible culprit.

On the morning of 13 June, the Spanish Navy diverted and detained the vessel at the Port of Almeria. The Spanish authorities later confirmed that this vessel was indeed involved in an illegal discharge of hydrocarbons, which created a 55 km2 spill about 150 nautical miles off Las Palmas.

The bond for the vessel's release was set at 600.000 EUR, a record high in Spain. The vessel's manager was later found guilty and fined for the illegal discharge.

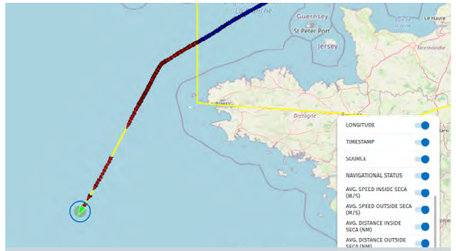


Satellite data overlayed with vessel detection information from EMSA's systems

3.9 Training and capacity building

The Agency organises regular training sessions to enable the users to understand the operational use of CSN service for polluter identification and response, to explain how to access and use data from EMSA's web interface, interpret the content of the alert report, and use the Feedback Form to report verification of detected spills for service validation. EMSA may also organise webinars focusing on a specific topic upon user request. It also provides support to Regional Agreements by providing service statistics every year. As from 2023, CSN training sessions are certified under ISO 29993/2017 requirements.

EMSA's Maritime Support Services **operations centre.**



Vessel track as shown on SEG.

4 OIL SPILL EMERGENCIES

In case of oil spills related to accidents or emergencies, the affected Coastal State can request additional satellite images to monitor the spill area over an extended period, capturing the evolution of the spill and supporting response and recovery operations.

The following section presents some examples of the support provided by CleanSeaNet in case of larger accidental spills.

Case study: Gibraltar

On 29 August 2022, the bulk carrier vessel OS 35 collided with LNG tanker ADAM LNG, while leaving the anchorage off Gibraltar Point, to the Netherlands. ADAM LNG was anchored at the time of collision and didn't suffer serious damages. However, bulk carrier OS 35 sustained a hull breach and was taken to the other side of the Gibraltar peninsula where she was grounded to avoid sinking.

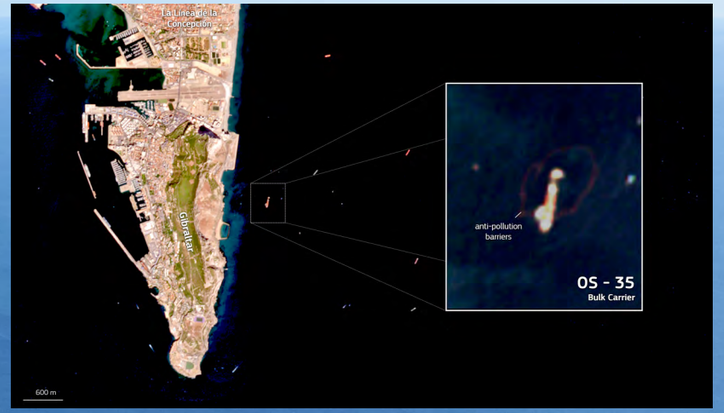
On 31 August, the hull of the Bulk Carrier OS 35 broke into two sections. Crew members and surveyors were evacuated from the vessel. Operations for containing and recovering leakage of oil had begun, in addition to operations for extracting bunker oil.

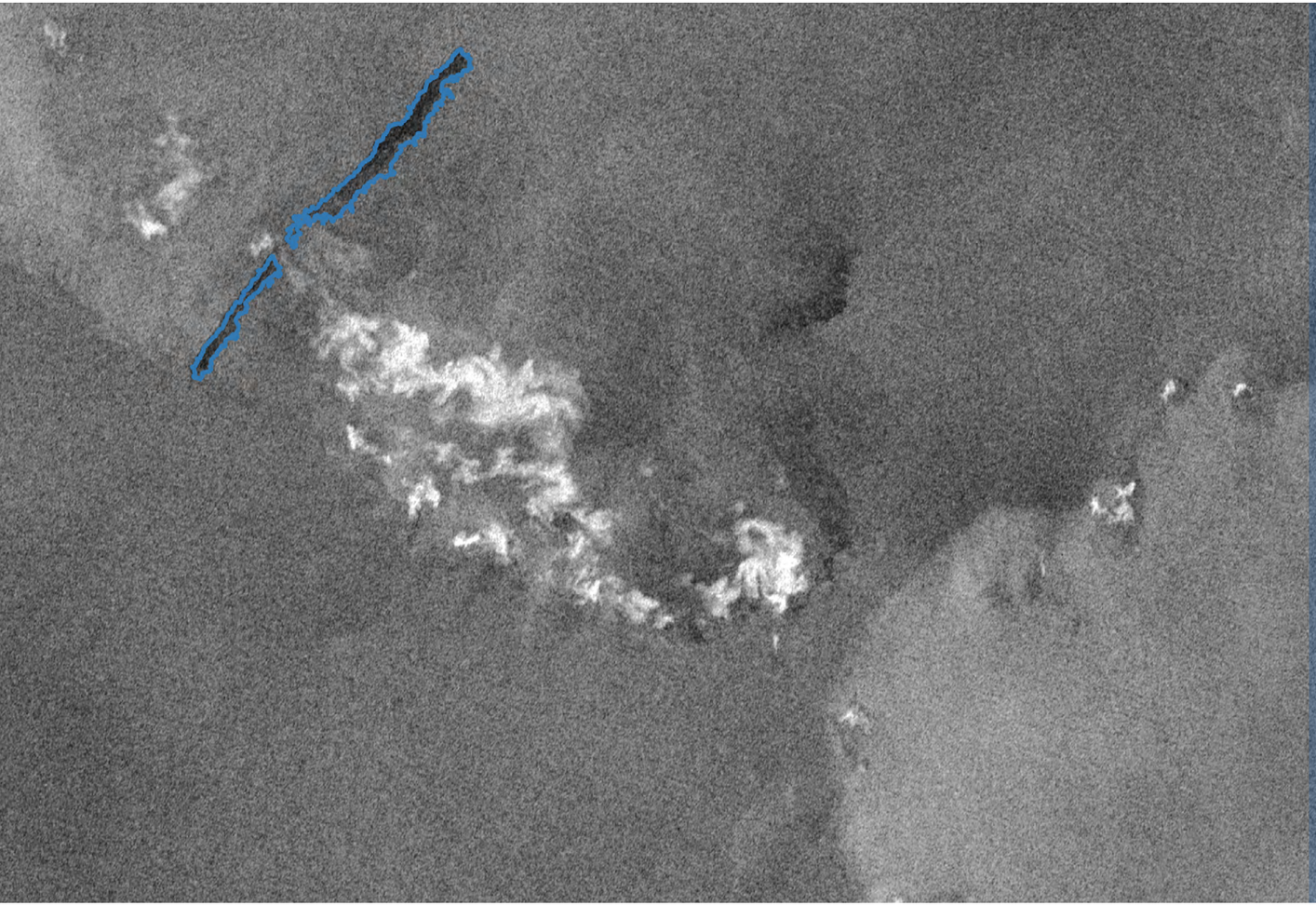
SASEMAR, the SAR agency of the Spanish Maritime Authority, Directorate General for Merchant Marine, requested Radar and Optical satellite images from EMSA.

These images provided several possible oil spills detections. Information on Oil Spill Response vessel "Monte Anaga" was also requested and provided by EMSA, as well as on the possible activation of its Remotely Piloted Aircraft Systems (RPAS) operations.

Gibraltar Authorities and SASEMAR deployed maritime means and anti-pollution equipment. Additional oil spill equipment was procured from the UK. Clean-up efforts focused on Sandy Bay, Little Bay, and Camp Bay beaches. Continuous monitoring was in place throughout the night, including drone and land based thermal imagining. Port operations reopened on a staggered basis.

The combination of CSN data, aerial mission observations and the production of regular drift forecasts were defined as crucial to support the incident management.





Case study: MRCC La Réunion

On 3 April 2022, the general cargo vessel MV MOMENTUM PHONIX, under the flag of Guyana, perpetrated a deliberate spillage of oil wastewater, in the French EEZ Tromelin island. An EMSA SAR satellite image detected a possible illegal discharge of oily water (bilge) in the wake of the MV. MOMENTUM PHONIX which was the only vessel in the vicinity of the slick.

Pollution and identity of the infringer was confirmed by a French Air Force Aircraft dispatched on scene after the red-classified oil spill report received from CleanSeaNet. The captain of the vessel was interrogated, and the French Public Prosecutor instructed the vessel to alter course and proceed to La Réunion for further inquiries.

However, MOMENTUM PHONIX failed to comply with the order.

Under the Indian Ocean MoU, the infringement was reported to the Port State Control authorities of her next port of call, Myanmar. The vessel was inspected there and detained due to numerous deficiencies, several of which were major non-compliances with MARPOL standards.

The vessel has so far managed to escape prosecution by carefully avoiding transiting through French EEZs. She is still being monitored and is liable to be intercepted at the first opportunity.

5 SPECIFIC OPERATIONS AND EXERCISES

5.1 Surveillance operations

The CleanSeaNet service may support specific operational scenarios demanding surveillance such as ship-to-ship transfers and bunkering operations.

The CSN service is regularly used to support coordinated anti-pollution operations, such as the Tour d'Horizon (TdH).

The Bonn Agreement coordinates the TdH programme with the participation of Coastal States adjacent to the North Sea.

This operation includes aerial surveillance of offshore oil and gas installations and vessels transiting the area.

Following a request by the State organising the TdH operation, and upon the analysis of the flight plan, EMSA proposes a list of additional CSN satellite acquisitions.

By using CSN imagery in conjunction with other operational assets such as aerial assets, authorities can react more quickly and effectively.

Case study: Tour d' Horizon operation 2022

In 2022, CSN service supported the Belgian Tour d'Horizon mission, which took place between 5 -9 September 2022.

During this five day campaign, 6 flights were planned to control pollution detections over a large amount of oil and gas platforms in the Tour D'horizon area.

Following the request, EMSA selected the imagery which was then assessed by the user based on the mission track and time frame.

A liaison officer was appointed to evaluate the satellite images and to report to operations team during the mission.

During TdH, 9 spills were detected in flight.

A total of 10 CSN satellites images were delivered.

In total 13 possible spills alerts had been received during the Belgian TdH 22, of which 9 were verified.

5 SAR detections could be confirmed as mineral oil (all connected to oil platforms) and 4 SAR detections could not be observed on-scene.

During this operation, the users reported their feedback in the SEG interface.

The CSN service also provides support to Co-ordinated Extended Pollution Control Operations (CEPCO), which are joint, continuous airborne surveillance operations.

These operations take place over a designated sea area for a given period, of one up to several days, with backup from patrol vessels and satellite observations.

The aims of these operations are to strengthen the enforcement of MARPOL regulations and increase the deterrent effect of airborne surveillance.

The operations also aim to raise the levels of cooperation and coordination between contracting parties to the Agreement for Co-operation in Dealing with Pollution of the North Sea by Oil and other Harmful Substances, better known as the Bonn Agreement.

5.2 Support to exercises

Every year, EMSA participates in national and international maritime pollution response exercises offering a range of services, including satellite imagery.

During notification exercises aiming to test the emergency procedures of the participating parties, the CSN service can provide a list of satellite acquisitions that could be used to monitor the areas of interest.

The list includes the satellite used, the acquisition date and time, and the type of image (SAR or optical), but no real satellite images will be ordered.

In operational exercises where sometimes oil spills are simulated by a non-reflecting and floating material, such as popcorn, rice husk or dye ink, CSN users may request additional optical images to support the exercise.

EMSA's RPAS in action

EMSA's oil spill response vessel 'Kijac'

Case study: COASTEX 2022

On 6 September 2022, the COASTEX-22 joint exercise took place in Croatia's Brački Kanal. Organised by the Croatian Coast Guard, it brought together representatives of 20 national coast guard agencies and European agencies (EMSA, EFCA and Frontex) with the aim to test various coast guard functions and improve their preparedness, coordination, and efficiency in the case of a maritime emergency.

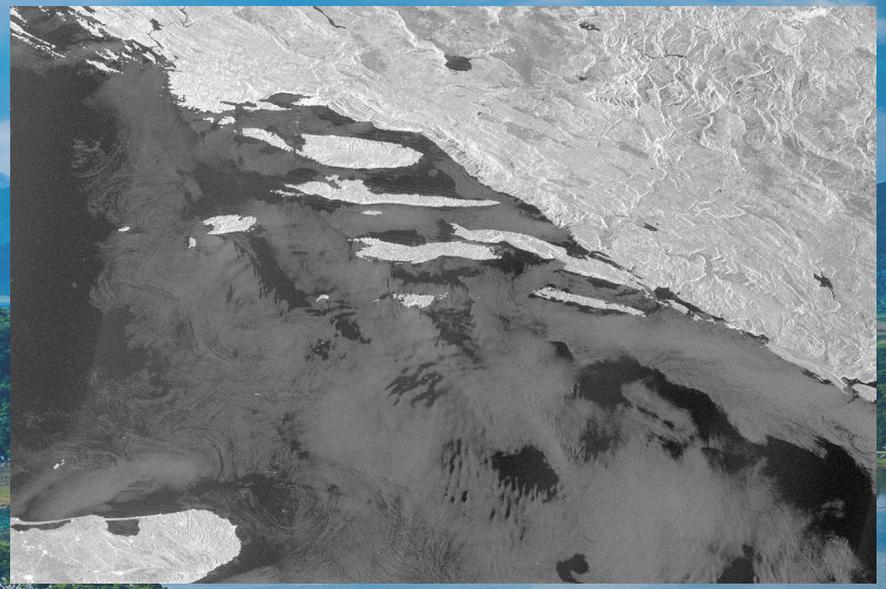
The exercise simulated a collision between two vessels near the city of Split, suffering heavy damage and, as staged, one crew member falling overboard and disappearing into the sea.

Civilian search and rescue boats activated an emergency operation in the area, requesting the Navy to provide immediate assistance.

Surveillance aircrafts, speedboats and constant communication via radio were all in place, to search and rescue the missing crew member.

According to the training scenario, the vessel collision caused a fuel leak. EMSA deployed its oil spill response vessel 'Kijac', as well as CleanSeaNet satellite imagery support, to pinpoint the disaster location and quickly coordinate on-site pollution responses.

COASTEX 2022 emergency operation exercise



Case Study: ATLANTIC POLEX PT 2022

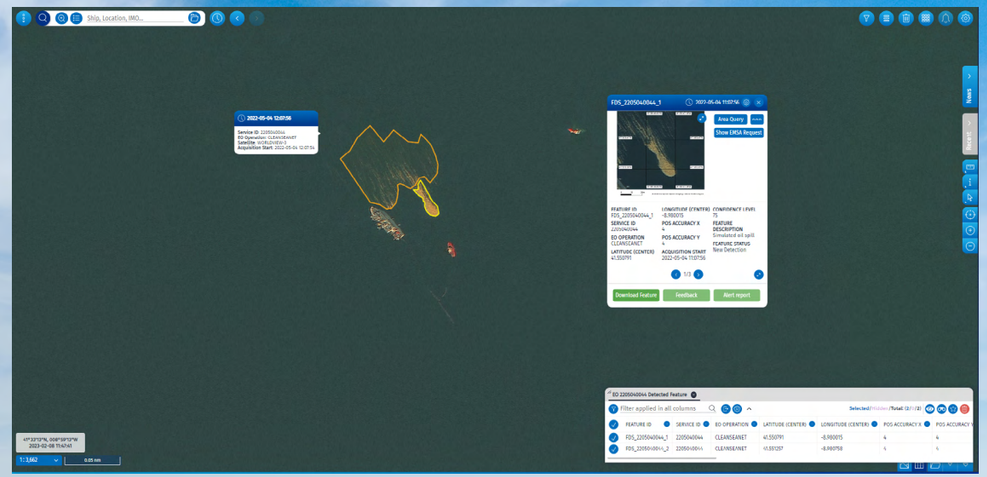
On 4-5 May 2022, EMSA took part in the annual ATLANTIC POLEX PT 2022 exercise organised by the Portuguese National Maritime Authority, taking place about 10 nautical miles southwest of Viana do Castelo. The exercise aims to train the response capabilities and joint operations in the context of pollution incidents of the marine environment.

Following a simulated 'explosion' on board a container ship, oil (simulated by popcorn) spread across the sea surface. Several sub-scenarios were simulated: the 'oil' pollution affecting an area on the high seas, as well as the coastal area of Viana do Castelo, namely the estuary of the Lima River, the port, the urban ecological park, nursery areas and beach areas.

Upon request by the Portuguese National Maritime Authority, a very high-resolution optical image was delivered by CleanSeaNet allowing the detection of non-reflective material that simulated an oil spill as a feature.

The operation of containment and collection of the polluting material involved the Portuguese National Maritime Authority, namely the North Maritime Department (based on Oporto), the Captain of the Port of Viana do Castelo and the Marine Pollution Response Directorate, as well as the Portuguese Navy, the Hydrographic Institute, the Portuguese Air Force, EMSA, among other entities.

The EMSA services assisted in the offshore part of the exercise, responding to the 'emergency' at the request of the authorities with the oil spill response vessel 'Ria de Vigo' and its equipment on board, including RPAS, as well as CleanSeaNet.

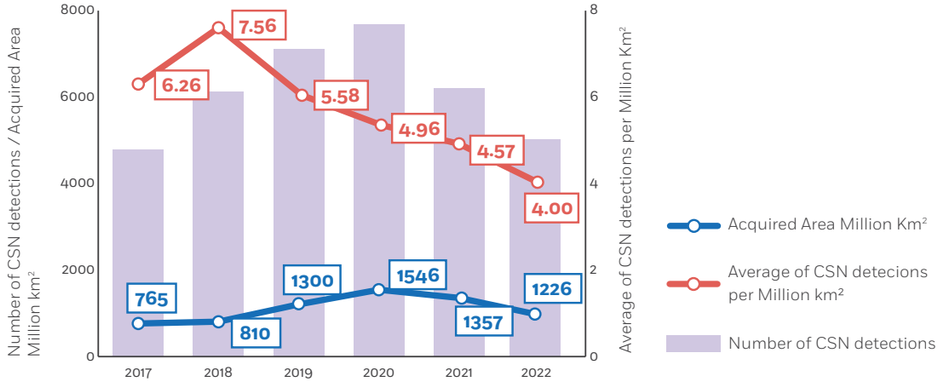


6 LONG TERM SERVICE TRENDS

CSN service greatly relies on the capabilities of Sentinel-1 mission, which offers high quality images for oil spills detection and reduced costs due to the license agreement with the European Commission (EC). In 2022, 73% of images delivered by CleanSeaNet were Sentinel-1 images, highlighting the importance of this constellation to the service. Overall, the service had an image delivery rate of over 98% to its users.

The average number of possible oil spills per million km2 has been decreasing since 2019 (5.6 in 2019, 5.0 in 2020, 4.6 in 2021 and 4.0 in 2022), showing that, overall, the long-term deterrent effect of CSN is robust and clearly visible in the significant reduction in the total number of spills monitored, thus proving the added value of the service to Coastal State administrations and to European citizens.

CleanSeaNet possible pollution detected: 2017 – 2022



7 OUTLOOK

Managing CSN service by providing the best possible service to users and implementing a continuous improvement approach is an effective way to ensure that the service meets the needs of its users and remains relevant over time. Future service developments will include:

- Integration of optical satellite images data to provide estimation of the spill volume, particularly in the case of larger oil spills (both from operational discharges as well as from accidents).
- Use of Artificial Intelligence to extract valuable information from satellite imagery and maximize the usefulness of EMSA's long-term dataset of satellite information.
- Integration of new Earth Observation (EO) sensors which can significantly enrich the existing portfolio of the EO service. This will be carefully planned and managed to ensure that the new capabilities are successfully transitioned to operations and can be effectively used by the service's users.

ACRONYMS

ACRONYMS AND ABBREVIATIONS	
AIS	Automatic Identification System
AOI	Area of Interest
CEPCO	Coordinated Extended Pollution Control Operations
CMS	Copernicus Maritime Surveillance
CSN	CleanSeaNet service
DTO	Data Take Opportunities
EC	European Commission
EEZ	Exclusive Economic Zone
EFCA	European Fisheries Control Agency
EFTA	European Free Trade Association
EMSA	European Maritime Safety Agency
ENP	European Neighbourhood Policy
EO	Earth Observation
EODC	Earth Observation Data Centre
ESA	European Space Agency
EU	European Union
EVS	Enriched Vessel Service
FRONTEX	European Border and Coast Guard Agency
HR	High Resolution

ACRONYMS AND ABBREVIATIONS	
IMO	International Maritime Organization
IPA	Pre-Accession Assistance
LRIT	Long Range Identification and Tracking
MARPOL	International Convention for the Prevention of Pollution from Ships
MMSI	Maritime Mobile Service Identity
MRCC	Maritime Rescue Coordination Centre
NCA	National Competent Authority
RPAS	Remotely Piloted Aircraft Systems
SAR	Synthetic aperture radar
SASEMAR	Search and Rescue Agency of the Spanish Maritime Authority
SEG	SafeSeaNet Ecosystem Graphical User Interface
TdH	Tour d' Horizon

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CLEASEANET SERVICES

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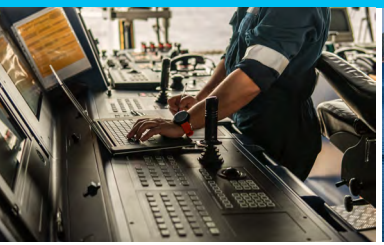


ABOUT THE EUROPEAN MARITIME SAFETY AGENCY

The European Maritime Safety Agency is one of the European Union's decentralised agencies. Based in Lisbon, the Agency's mission is to ensure a high level of maritime safety, maritime security, prevention of and response to pollution from ships, as well as response to marine pollution from oil and gas installations. The overall purpose is to promote a safe, clean and economically viable maritime sector in the EU.

Get in touch for more information

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