

Interspill 2022

Evolution of the CleanSeaNet service of the European Maritime Safety Agency (EMSA)

Extended abstract for the conference session: Surveillance, modelling and visualisation

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Introduction

CleanSeaNet (CSN) is the European satellite-based oil spill monitoring and vessel detection service, developed and operated by the European Maritime Safety Agency (EMSA). The service analyses satellite images, mainly from Synthetic Aperture Radar (SAR) and, occasionally, from optical missions, to detect possible oil spills on the sea surface, identify potential polluters and provide this information in quasi real time (usually in less than 20 minutes after satellite image acquisition) to its users. Since its launching in April 2007, the service has been supporting user's operational actions in combating deliberate or accidental pollution in the marine environment. Being an active sensor, the SAR is capable to detect thin oil films on the sea surface, during day or night-time and under any cloud cover condition, allowing 24/7 monitoring. In the SAR images, oil spills are seen as dark patches and vessels and other platforms as bright white spots.

CSN user community

The CSN serves a vast community including more than 650 operational users from national authorities responsible for oil pollution monitoring, preparedness, and response. These include maritime authorities (e.g. Navy, Coast Guard), maritime rescue coordination centres (MRCC's) and Environmental Agencies. The service is provided to the Coastal EU Members States, their overseas territories and EFTA countries. It is also offered to European Neighbourhood (ENP) countries such as the beneficiaries of the Instrument for Pre-accession Assistance (IPA), to participating countries of SAFEMED, Black and Caspian Sea projects, to EU Institutions and international organisations.

Quasi-real time performance

Since 2018 EMSA has introduced a faster delivery of information to end users. CleanSeaNet products, including oil spill alerting, oil spill analysis, polluter identification and satellite images are in most cases available within 20 minutes after satellite image acquisition. In 2021, 93% of the total oil spill notifications were available to end users in less than 20 minutes, demonstrating EMSA's ability to deliver timely information, contributing to Member States' activities in the detection and prosecution of illegal discharges at sea.

Long term results

The vast majority of CSN routine service is acquired from Sentinel-1 (S1) SAR mission. In 2021, S1 provided 88% of the overall CSN images, followed by Radarsat-2 (RS2) and TerraSAR-X (TSX) missions.

From 2015 to 2021, 37.588 images were delivered by the service, and around 40.223 possible oil spills were detected. The average area monitored during the last six-years period was around 1000 million km². The average number of possible oil spills per million km² has dropped since 2019 (5.6 in 2019, 5.0 in 2020 and to 4.6 in 2021)(Figure 1), showing that the long-term deterrent effect of CSN is robust and clearly visible in the significant reduction in the total number of spills monitored, evidencing the added value of the service to coastal State's administrations.

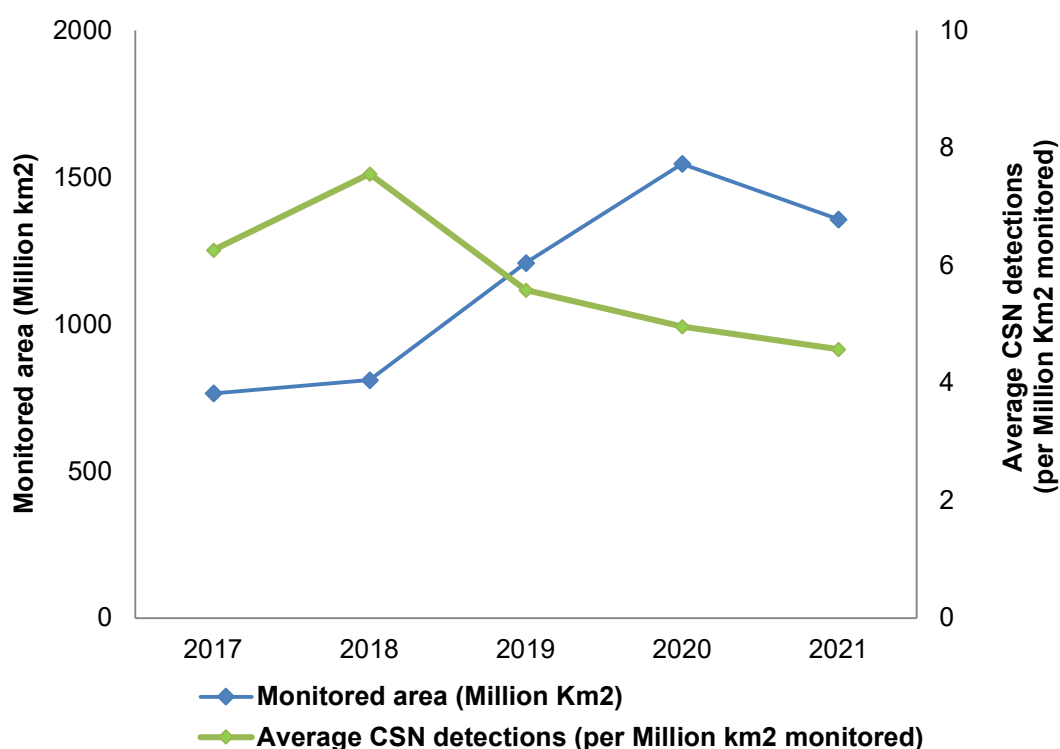


Figure 1: Acquired Area and average of CSN detections per Mkm², 2017-2021

Additional operational support

On top of the regular monitoring activities, CSN service provides assistance to specific operations, exercises and emergencies. In 2021, the service supported three aerial surveillance operations delivering 24 SAR images and supported seven pollution response exercises delivering five optical images. During the same year, a total of 60 SAR and 8 optical images were ordered to support emergencies related to oil spill monitoring, in the framework of EMSA's contingency plan.

Service developments

From a continuous improvement perspective, in 2022 new EO value-added products became available to the end users. Moreover, the CSN mission's portfolio was enhanced with the integration of a new SAR dual mission (PAZ), resulting in a significant improvement of the revisit time and increased daily imaging coverage. Two new ground stations (Greece and Canada) improved the service coverage. It is foreseen that in 2022, a new constellation of SAR microsatellites (ICEYE), which has the ability to observe a location at different times of the day, will bring new capabilities to the service such as the evolution of imaging modes.

A pilot project to assess the feasibility of Sentinel-2 images to estimate oil spill volumes, for assistance in emergencies and large accidental spills, is also in progress, which if successful, can greatly contribute to the support provided by the Agency to Member States during large combatable spills.

Conclusion

Since its implementation in 2007, the CSN service has proved to be a valuable element of the national enforcement chain in place to detect and combat marine pollution. The service enables coastal States to monitor very large areas and to target their surveillance efforts in specific locations identified by CSN. This creates significant monitoring efficiency, enhances follow-up actions, reduces costs of aerial surveillance, increasing probabilities to detect illegal activities and overall provides a strong deterrent effect on polluters.