

Copernicus Maritime Surveillance Service

Maritime Security Workshop Report

V0.1

Date: 28/05/2019



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1. Introduction

Copernicus is a European Union (EU) Programme aimed at developing European information services based on satellite Earth Observation (EO) and in-situ (non-space) data¹. The European Maritime Safety Agency (EMSA) is the Entrusted Entity responsible for implementing the Copernicus Maritime Surveillance (CMS) service under a Delegation Agreement signed with the European Commission (EC).

The CMS service supports monitoring of human activity at sea for a range of functions, including amongst others, maritime safety and security, fisheries control, marine pollution monitoring, and law enforcement. The CMS service can be accessed by national administrations with responsibilities at sea, as well as relevant EU bodies and institutions. It provides additional EO information through existing EMSA applications, and also establishes new opportunities to use remote sensing data in contexts in which it may not have been used in the past. Copernicus products can extend the geographical scope and enhance the types of maritime information available, thereby contributing to an overall improvement of maritime domain awareness.

To continue the dialogue with users, and with the purpose of eliciting needs, generating new ideas, assess feedback on the use of the service and gathering operational requirements, a Maritime Security Workshop was hosted at EMSA's premises in Lisbon, on 14 May 2019.

The workshop was aimed at operational staff of administrations with responsibilities at sea, namely those with maritime security operations. In total, the workshop was attended by 57 participants. Representatives of 15 EU Member State administrations were present: Bulgaria, Denmark, Finland, France, Germany, Greece, Italy, Latvia, Poland, Portugal, Romania, Slovenia, Spain, The Netherlands and the United Kingdom. The EC was represented by the Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW). In addition, participants from the following European bodies also attended the workshop: European External Action Service (EEAS), European Union Naval Force (EU NAVFOR) and the European Union Agency for Law Enforcement Cooperation (Europol). The United Nations Office of Drugs and Crime (UNODC) was participated with a participant from the Global Maritime Crime Programme (GMCP).



Figure 1: Workshop participants

¹ For more information on the programme in general, please see www.copernicus.eu.

2. Welcome and opening

Opening remarks by Maja Markovčić Kostelac, Executive Director, EMSA.

Dear participants,

Welcome to EMSA and to this Copernicus Maritime Surveillance Maritime Security Workshop. This promises to be a day of interesting discussion. Although there are many familiar faces around the table, for some of you, this may be the first time you hear about the possibilities offered by the Copernicus earth observation data and supporting data available through EMSA.

The Copernicus Maritime Surveillance (CMS) service is managed by the Commission and implemented by EMSA. CMS delivers services in a wide range of function areas in the maritime domain. One of which, and which is of ever-increasing importance, is that of Maritime Security.

As everyone here is well aware, Maritime Security covers a wide range of activities, often of a sensitive nature. At EU level, the scope is defined by the European Union Maritime Security Strategy (EUMSS) which was initially adopted in 2014, along with a complementary Action Plan. From the beginning, EMSA had a key role in actions related to maritime awareness, surveillance and information sharing. The Action Plan was recently revised in June 2018, and in it, also the role of Copernicus is explicitly addressed.

During the Workshop today, we hope to hear more about your use cases and user needs. We hope that on your side, you will leave with a better understanding of the Copernicus Maritime Surveillance service and how it can serve your needs by contributing to a more complete maritime awareness picture.

The goal of maritime security can only be achieved if authorities have oversight of what is going on at sea, and although great strides are being made, we should remember that the tools and technology we rely on today has only been available in the very recent past. First came a suite of vessel traffic monitoring systems, based on radio or satellite communications channels, to provide information such as regularly updated vessel position points and destination ports. Even more recently, satellite AIS data provision also became a possibility. EMSA has been at the forefront of these developments, and provides integrated maritime services which combine information from a variety of different vessel tracking systems.

But what about satellite earth observation data? Earth observation data has long been recognised as a useful tool for monitoring activities at sea. However, in the past, the expense of this data, and the complexity in terms of planning, ordering and integrating data, proved a barrier to widespread uptake.

Through the Copernicus Programme, these barriers are being overcome. The CMS service implemented here in EMSA therefore marks a change with regard to the range, volume and timeliness of earth observation data available to maritime authorities, who can now obtain satellite images of their areas of interest globally, whether in coastal regions, third countries, or on the high seas. This data from around the world is available within hours or even minutes after the satellite has passed an area of interest. The impact of this data is even more powerful when combined with the other data available in-house or additional data from users. The CMS service became operational only in 2016, and the user base is still growing, but it is already clear that earth observation products can add considerable value to the maritime picture.

Clearly, the range and volume of different data types available now is substantially different to that of even a decade ago. The challenge now is to ensure that the data is made available to the authorities that need it, and that it is used to best effect. To do that, we rely on your input, and on events such as

the Workshop of today. Together, we can ensure that these new opportunities are seized, and benefit Europe through increased capacity to ensure Maritime Security in European seas and beyond.

With these remarks, I would now like to pass over to the Chair to start the business of the Workshop.

Thank-you for your attention and wishing you fruitful and interesting discussions across the course of the day.

Maja Markovčić Kostelac, Executive Director, EMSA



Figure 2: Welcome and opening

The Chair of the workshop, Leendert Bal, Head of Department: Operations, EMSA, then outlined the agenda for the day, and introduced the speakers.

Using an audience interaction tool, EMSA asked the participants: 1) what do you expect from this Workshop, and 2) to give an example of a domain which could benefit from the CMS service. The results were projected in real time as word clouds.



Figure 3: Word cloud responses to the question 'What do you expect from this Workshop?'

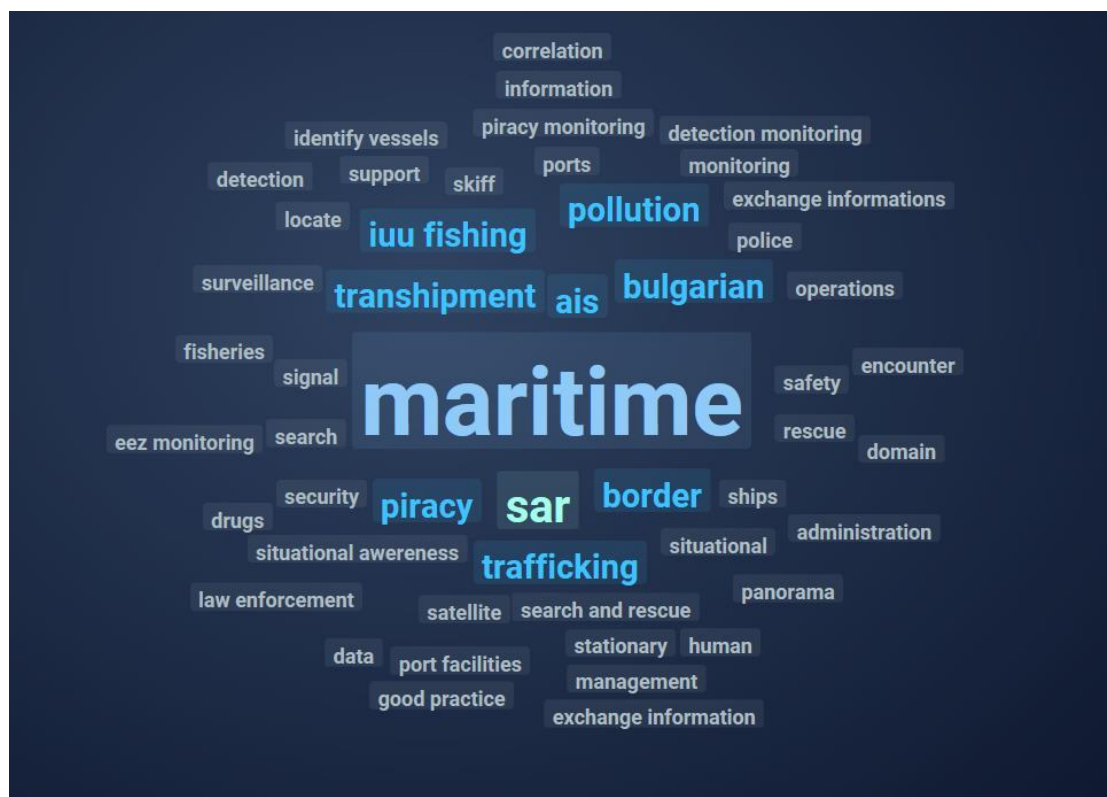


Figure 4: Word cloud responses to the request to provide examples of maritime security use cases

3. Setting the scene: Maritime Security

The first three presentations set the tone for the rest of the Workshop, providing some contextual information about the EU's Maritime Security Strategy (EUMSS) and other relevant policies, and updating the participants about recent trends in piracy and maritime crime.

3.1 The EU Maritime Security Policies

Ezio Lama, Senior Maritime Security Policy Officer, European External Action Service (EEAS)

An overview of EU interests and the European Maritime Security Strategy developed to protect these was presented. Although figures are contested, global trade (approximately 90%) is largely a seaborne activity, which makes safe seas a priority in economic development and stability worldwide. Additional information was provided to reinforce the importance of the blue economy, such as the fact that at least 50% of the EU population live in coastal areas and 40% of the world fleet is controlled by EU companies.

Maritime trade can be affected by many factors, human or natural, e.g. regional instability; armed attacks; illegal fishing; organized crime; natural disasters or climate change. All these lead to an eventual disruption of global supply chains, attacks on people and goods and environmental disasters.

For this purpose, an Action Plan was established to reflect an EU cross-sectoral approach with the aim to reaffirm the role of the EU as a global maritime security provider.

Several areas of high risk around the world were highlighted as being major threats in key sea routes. Some of these locations have been already monitored by CMS services, for example through joint UNODC and EU initiatives which were facilitated by the EEAS.

A table showing the number of actual and attempted attacks in 2018 was shown, indicating that piracy and other threats are still present in various regions, from Nigeria to Indonesia.

The use of CMS and the Integrated Maritime Services (IMS) should be reinforced, as these have been determinant for many operations, including for the success of naval operations outside Europe and for the capacity building activities funded by the EU and implemented by the UNODC.

3.2 Recent developments in piracy

Lt CDR Diego Canovas-Canovas, European Union Naval Force (EU NAVFOR), Operation Atalanta

The EU NAVFOR presentation was delivered within the scope of providing an outlook of the maritime security challenges EU countries face in the Horn of Africa. The presentation started by providing an insight into the Operation Atalanta core tasks.

The protection of vulnerable shipping and the repression of piracy led to a significant decrease of pirated vessels between 2012 and the present date. A few examples of recent piracy incidents in the Somali Basin were shown, indicating that although attacks have been significantly reduced, piracy is still an ongoing concern in the region.

Other tasks include the monitoring of fishing activities and other security threats, such as human trafficking and drug and weapons smuggling. It was also pointed out that the nearby Yemeni conflict poses threats to merchant ships in the area.

The presenter summarised the piracy pattern as going from a "Most Likely Course of Action" to a "Most Dangerous Course of Action", which is intrinsically related to the collapse of local security forces

and economies, leading to the surge of strong pirate leaders and an increased volume of piracy activity.

Although most attacks occur 200 to 300 nautical miles from the shore, the monitoring of pirate campsites along the Somali coastline is crucial to anticipate attacks and contributes to the success of the EU NAVFOR operations.

In conclusion, the future use of CMS services were highlighted as having an important role, providing an additional asset to support the detection of unreported and potentially hostile movements in the area.

3.3 Recent developments in international maritime crime

Joana Fundo, Strategic Analyst, Operations Department, The European Union Agency for Law Enforcement Cooperation (EUROPOL)

Europol is the European Union's law enforcement agency, assisting the 28 EU Member States in their fight against serious international crime and terrorism. Europol and EMSA signed a Working Arrangement at the end of 2018, establishing cooperative relations between the two agencies. Training to Europol staff on Integrated Maritime Services has recently been delivered at EMSA.

Three main areas were presented as examples of criminal activities occurring in the maritime domain: illegal trafficking of firearms; migrant smuggling and drug trafficking.

Illegal trafficking of firearms continues to be a major issue, generating substantial profits for the criminals involved as well as represents a facilitating and enabling factor for serious and organised crime. It is an area where more intelligence gathering and stronger cooperation with third partners is necessary. As in many other cases, it was highlighted that illegal trafficking of arms often happens simultaneously with other criminal activities, as drug trafficking. Although the focus of fighting firearms trafficking is frequently centred in the online domain and land routes, maritime transport to conflict regions is still of a major concern. Conscious of the threat and most important of all, conscious that there was probably more happening without the complete understanding of the authorities and the full coordination of the different operators, a pilot project was setup to tackle this phenomenon.

The joint police-customs operations, Columbus 2017 and 2018, involving several EU countries, Frontex and supported by Europol were presented. The main objectives of the operation were to better explore detection and vessel tracking capabilities, make a risk assessment of switch-on-switch-off AIS practices and other suspicious behaviours. The monitor of previous profiled vessels of interest was performed. The success of this operation is not measured on the number of seizures /boarding's performed, but in the achievements obtained in terms of the efficiency for information exchange and best practices developed among the different participants

Further details of the intelligence gathering phase were explained. This phase includes analysis of risk indicators, some of which are provided through the Eurosur Fusion Services, which use data originating from EMSA systems (e.g. vessel tracking, satellite earth observation products) as well as vessels identified by other sources. Regarding the theatre of operations, nine areas were identified as hotspots.

With regard to migrant smuggling, it was noted that the Western Mediterranean route was the most frequently used route into Europe in 2018. Big vessels have not been observed in this kind of criminal activity; so far, traffickers have used smaller vessels, such as fishing vessels and speed boats. An overview was also given of the Central and Eastern Mediterranean routes, noting that for the first trimester of 2019, the Eastern Mediterranean route had surpassed the Western Mediterranean route as the most frequented.

An overview was given of some of the main trends in cocaine, heroin and cannabis smuggling, and the main maritime routes and means of transportation by which these substances are trafficked.

Particular focus was done to cocaine trafficking-the expected impact of the substantial increase in coca leaf cultivation and cocaine production in Colombia is now fully apparent in the EU with the increased quantities seized in the last years. Container trafficking especially rip on/rip off continues to be the most common MO, but cargo vessels, fishing vessels and pleasure crafts are also frequently found involved in cocaine trafficking.

To conclude, it was noted that illegal traffic in the maritime domain has become increasingly professional and organized. Smugglers use new strategies, diversify routes and improve concealment methods in vessels that are frequently engaged in legitimate trade, which make their activities harder to detect.

5. Copernicus Maritime Surveillance Service

5.1 Copernicus Programme and Copernicus Security Services

Rui Meneses, Policy Officer for Copernicus Security Services, Directorate General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW)

Rui Meneses delivered a presentation providing an overview of the Copernicus Programme. Copernicus is an EU-led initiative for an autonomous and operational European earth monitoring capacities. It has been developed by the EC in partnership with the European Space Agency. It is currently the largest Earth Observation programme in the world and it provides accurate, timely and easily accessible data in several domains.

The provision of Copernicus services is based on the processing of data collected from EO satellites and *in situ* sensors. The EO satellites which provide the data exploited by the Copernicus services are split into two groups of missions: 1) the Sentinels, which are currently being developed for the specific needs of the Copernicus programme; 2) the Contributing Missions, which are operated by national, European or international organisations. This data is further supported with information coming from ground-based data.

The Copernicus Programme services comprises six thematic areas: land, marine, atmosphere, climate change, emergency management and security. Most services are free and open data, with the public having access to its data and product. The Copernicus Maritime Surveillance is part of the Security Services and its data is restricted to authorised users and has limited distribution.

There are five main drivers for the Copernicus Programme in the upcoming years: i) reaffirmation of the role of the EU as a major player in the space area maximising the benefits of Space; ii) fostering EU global competitiveness and innovation of the space sector; iii) reinforcing EU autonomy; iv) promoting Europe as a global player and reinforcing international cooperation; v) streamlined governance structure for efficient delivery. This is all taking place in the context of the new EU Space Programme for 2021-27, which consolidates all space-related activities of the EU - including earth observation through Copernicus, but also satellite navigation systems and services and new security components - into a single Regulation.

Please contact the Commission or Rui Meneses directly at rui.meneses@ec.europa.eu at any time with questions, comments, suggestions, or additional requirements.

5.2 Copernicus Maritime Surveillance

Pedro Lourenço, Earth Observation Services, EMSA

A concise overview was given of the Copernicus Security Service (comprising Maritime Surveillance, Border Control and Support for External Action), noting that for the Security Service - unlike other Copernicus services – data is not free and open, but provided directly to authorised users in a secure manner. The presentation then summarised the satellite missions which provide products to the CMS service, outlining briefly some of the advantages and drawbacks of synthetic aperture radar (SAR) and optical satellites respectively.

Participants were reminded that the CMS service is delivered as one component of the EMSA integrated maritime services, and an essential feature of the service is therefore that earth observation data can be combined with other data, such as from vessel reporting systems.

Finally, participants were introduced each of the main function areas served by CMS (fisheries control, maritime safety and security, law enforcement, customs, marine environment, support to international organisations), and provided with information on the volume of services ordered by users so far in 2019.

6. User Presentations

6.1 Portuguese Navy – Marinha Portuguesa

Miguel Bessa Pacheco, Commander, Director of the Centre for the Management and Analysis of Operational Data (Centro de Gestão e Análise de Dados Operacionais – CADOP)

The Portuguese Navy has been using the CMS service for two years. With a large area to cover and limited resources, it uses CMS for Maritime Security operations, amongst others.

The first part of the presentation focused on the use of CMS by the Navy to support third countries in Africa. The Gulf of Guinea includes five countries in which Portuguese is an official language, in an area rich in natural resources.

Maritime criminality in the Gulf of Guinea happens in five domains: fishing; environment; trafficking and smuggling; infrastructure, and shipping. These are exacerbated by poor governance and the limited authority of the coastal states in the region, which condition their capacity to monitor and successfully fight criminality and reduces propensity for international cooperation.

It was reported that there were 146 attacks in 2018, mostly during the first semester of the year and happening on the high seas or on anchored vessels. In 2019 the attacks appear to be steadily increasing when compared to the same period of 2018, especially in cases of theft and kidnapping.

In São Tomé and Príncipe, the Portuguese Navy has been involved in capacity building activities with the local Coast Guard. Satellite images were provided by CMS service, which were used for the identification of nonreporting vessels in the area.

The CMS service was also activated to support the Portuguese Navy's activities in Mozambique, in the aftermath of Cyclone Idai. Optical images allowed for the identification of damaged infrastructure and flooded areas and contributed to a safe navigation of the Navy's rigid-hulled inflatable boats.

Law enforcement in Portuguese waters was the last topic presented. CMS services are used widely across the vast Portuguese Economic Exclusive Zone, especially in the monitoring of maritime traffic corridors for safety of navigation and detection of pollution at sea. Satellite images and EMSA's Integrated Maritime Services provide additional awareness of maritime activity in areas that would otherwise be difficult to monitor.

6.2 Spanish Navy - Armada Española

Alejandro Cervantes, Commander, Maritime Operations & Surveillance Center (COVAM), Armada Española - Spanish Navy

The Spanish Armada has been using CMS for purposes of maritime safety and security. The presentation delivered presented two different scenarios: in Spain's coastal and high seas areas, and operations further afield. The Armada provides 24/7 maritime guidance for Spanish vessels in areas outside Europe, such as in the Indian Ocean and the Gulf of Guinea, by monitoring their transits (about 2000 per year) and by delivering security warnings on any known security incident ahead their path.

The presentation provided some figures on the number of incidents reported to the Spanish Navy, which have been on the rise since 2010, although the areas patrolled have also been increasing.

Since 2012 the Armada has been active in the monitoring of maritime traffic in the Gulf of Guinea and has also been undertaking operations in this maritime region, as well as along Western the Somali coast (2009) and that of Libya (2015). CMS services are now used in these operations, with both SAR and optical acquisitions being requested for maritime security and surveillance purposes in the

maritime area surrounding the Niger Delta and also in the EEZ spaces of Cape Verde and Mauritania. These operations use data received from CMS and other EMSA systems, then used operationally based on assets in the area, cooperation with civil authorities and open-source intelligence.

Regarding Spanish coastal and high seas areas, CMS requests are made in coordination with Spanish Customs (DAVA) to avoid duplicity. Requests focus on supporting maritime awareness and detection of irregular behaviours or activities for direct response or for warning the appropriate authority.

6.3 UNODC Global Maritime Crime Programme

Giuseppe Sernia, Programme Officer, United Nations Office on Drugs and Crime (UNODC), Regional Office for West and Central Africa

The United Nations Office on Drugs and Crime (UNODC) implements a Global Maritime Crime Programme (GMCP) with activities in the areas of counter-piracy, maritime capacity building, and combating maritime crime including the trafficking of illicit substances by sea.

Cooperation between the UNODC and EMSA began in September 2016. Requests from UNODC are channelled through the European External Action Service (EEAS) and approved by DG GROW, with the involvement of the respective EU delegation in the country or countries concerned. Local security forces are mentored by UNODC officials, who provide support and guarantee that the satellite images provided are effectively exploited by the law enforcement agency of the assisted country.

The UNODC has delivered capacity building trainings to São Tomé and Príncipe authorities, aiding in the development of a strategy and boarding plan, improving safety procedures, and simulating boarding exercises with the use of satellite images provided by CMS. Examples were given of a number of the exercises undertaken, including the African NEMO exercises.

6.4 German Waterways Police

Hartmut Neumann, Head of the Reporting and Coordination Centre, German Waterways Police

The German Waterways Police has responsibilities in monitoring the coastal areas, waterways and harbours of Germany. Their duties include the surveillance of maritime traffic, inspection of ships and prevention of environmental crime at sea. The actions undertaken by the German Waterways Police are coordinated through the Reporting and Coordination Centre of the German Waterways Police within the Maritime Safety and Security Centre in Cuxhaven.

Prior to using the CMS service, the German Waterways Police had experience with using the CleanSeaNet service for monitoring oil pollution in German waters. Use of the CMS service started in 2017, with satellite images being requested for law enforcement operations in advance of a major police operation in July. The experience of using CMS with Integrated Maritime Services was positive, although it was concluded that the use of optical satellite images was of more value in advance of the event rather than during it; this was partly due to managing expectations in terms of the characteristics of satellite image products.

The German Waterways Police worked closely with EMSA during the Interpol operation '30 Days at Sea', in October 2018, which focused on tackling environmental crime. The specific operation being undertaken by the German Waterways Police was related to irregularities in ship scrapping, in contravention of Regulation (EC) No 1013/2006. Weekly high-resolution optical satellite images were requested during this period to detect specific ships suspected of illegal beaching outside Europe, following analysis based on ship tracking data from the EMSA applications, amongst others. The use of CMS during the '30 Days at Sea' was considered a success and a helpful way of gathering evidence with regard to illegal shipment of waste; details of the ships to be scrapped were clearly visible in the optical satellite images. The operation provided yet further confirmation that

environmental crime is widespread, and can have grave consequences in the destination countries, both in terms of ecological and human impact.

6.5 Question and answer session

Following the presentations, there was limited time for questions. A brief discussion followed on the terms transshipment and ship-to-ship transfer, and on the term brown water. In response to a question asking who can request maritime surveillance services, EMSA responded that any national administration with responsibilities in the maritime domain could request services, as well as any EU body. International organisations can request services which are approved by EEAS and DG GROW on a case-by-case basis. In order to receive services, users have to be registered to access the EMSA Integrated Maritime Services interface, which is done by EMSA and a national point of contact. Thereafter, the interaction (planning and ordering of services) is between EMSA and the user organization directly.

7. Breakout Sessions

7.1 Breakout Session 1: CSDP/EU Missions

The session started with a brief introduction by the moderator on topics to be addressed during the breakout session. There were 11 participants present in the session, including representatives from the EEAS, UNODC, and from countries participating to international joint operations in third countries such as Portugal, Spain, France. Leendert Bal, Head of Department Operations, EMSA, was the chair.

I. EMSA services for CSDP

The session began with a discussion on how the EMSA capabilities, and specifically CMS, could be used to support Common Security and Defence Policy (CSDP) missions. The main consensus was that there would be high demand for further activities to support the training and capacity building of CSDP missions with local partners. This should be imbedded in ongoing consultation with the European Commission and Member States. Further dialogue with the EU Satellite Centre (SatCen) should be fostered, e.g. for use of information based on reports of Support to External Activity (SEA) which could identify further areas of interest to trigger CMS activations.

II. CMS support to Gulf of Guinea (GoG)

Regarding the GoG, there are currently no ongoing CSDP missions, although EMSA is supporting several Member State operations. The discussion led to the conclusion that it would make sense from an operational point of view to move to more structured support for the region, which should be earmarked in the Copernicus Implementation Plan.

Capacity building activities undertaken by the EU and the United Nations (UN) are understood as important to increase the level of technical knowledge and skills in African countries.

The sharing of data and products among the different organizations can lead to an optimization of the use of CMS information. To benefit fully from EMSA services in the area, cooperation and knowledge exchange between all the actors involved is of the utmost importance.

III. CMS improvements

Regarding the service evolution, developments in the delivery time for both SAR and optical acquisitions and an increased number of featured products were discussed, e.g. activity detection, feature detection, wake detection, change detection.

IV. Future implementation and capabilities

Regarding the future of the service, several suggestions were made:

- To meet user needs, support and services should be offered on a 24/365 basis.
- The use of VHF Data Exchange System as well as of mobile satellite phone tracking to support vessel detection should be explored.
- Integration of new satellite constellations could provide an additional source of satellite data (optical and SAR).
- The integration of satellite AIS data with improved latency time should be considered.

Participants also inquired about the EMSA Remotely Piloted Aircraft System (RPAS) operations, synergies with Frontex Maritime Aerial Surveillance (MAS) and the possibility to request RPAS based services through Copernicus. The integration of RPAS operations in Copernicus is being analysed by DG GROW.

7.2 Breakout Session 2: Technological Requirements

This session focused on technological requirements for the CMS service and was chaired by the Head of the Earth Observation Services, Pedro Lourenço.

I. EO Capabilities

Participants in this session inquired about further exploring EO capabilities with the purpose of maximizing surveillance through satellite images. It was noted that the maturity in terms of experience with use of earth observation data varied considerably between the users.

Following a short discussion of using satellite data for operational purposes, it was noted that many users send summaries of the relevant information or more streamlined derived data to their assets in the field. Size and bandwidth of EO products should be considered in order to enable delivery in remote locations for those users who would like to access the full product; more developed reports, such as EMSA provides for oil spills, could be considered for other products if there were sufficient demand.

Frequent revisit times and fast tasking is regarded as an important, allowing for a rapid tracking of vessels of interest. Participants asked about the possibility of permanent monitoring of an area – this could enable users to access data in the period immediately preceding an incident. It was noted that acquiring past data can be complicated, particularly in maritime areas, as satellites are only turned on when images are ordered. Routine monitoring, e.g. several images per week over a certain area, could be a possible solution in specific areas where it is anticipated there may be a need for data from the recent past.

With regard to a question relating to the update times of the latest vessel position reports and potential errors in correlation with VDS, it was noted that a new generation of satellites should soon be launched, and the position reports will be more frequently updated. Until then, select the latest vessel position to see the source and time of the last update.

II. Detection based on other sensors

The possibility of satellite based thermal infrared sensors was considered interesting for a range of use cases, e.g. flare detection. The resolution would not be high enough to distinguish details, such as whether a small vessel was crewed by limited crew or if it had on board a large number of people.

Regarding radio frequency detection, participants were asked first about their interest in the ability to detect satellite phones. This is relevant for maritime security, particularly for IUU and anti-piracy use cases. It was explained that in the case of Thuraya, the detection of the specific brand of phone is possible. This could be interesting in cases of hijacking, where provision of satellites phones is sometimes one of the demands of the hijackers, along with ransom. The detection of cell phones could also be important for search and rescue type scenarios. It was noted that in both these cases, the antenna has to be actively transmitting, i.e. the phone has to be in use, not simply on board a vessel.

Ability to detect specific maritime radars (i.e. brand or country of origin) and marine VHF detection could be important for several use cases, while detection of AIS emitters would be useful to identify AIS spoofing situations.

With regard to lead times for new technologies, there was some speculation over what would be possible in coming years. Technologically, some of these options may become available within the next couple of years. From EMSA's perspective, it would be necessary to know whether and which of these possibilities would be most interesting to users, then to have a proof of concept, and, if successful, offer it in operation as a stable service. The earliest that any of these data sources might be integrated in EMSA services would be 2021.

III. Systems

There was interest from some participants in receiving EO and other EMSA data system-to-system. EMSA also reiterated that users can access data either through the web interface, or via system to system interfaces, which are based on standard interfaces. Users interested in this latter option should write a letter of request to EMSA.

Machine learning algorithms to extract information from the satellite images are useful for maritime security applications. The use of predictive analytics is thought fundamental to forecast vessel behaviour, crucial for maritime security.

It was agreed that artificial intelligence can and should be used to derive additional value from existing satellite-based information.

7.3 Breakout Session 3: Use Cases

This session was chaired by Helena Ramon Jarraud, Head of Unit for Maritime Surveillance, EMSA, and was focused on exploring use case requirements and experiences. Four main areas of operation were detailed:

I. General area surveillance

In this scenario several topics of interest were addressed, including the detection of specific targets of interest and the detection of maritime threats in territorial waters. Detection of unidentified targets in sensitive areas such as ports and coastal cities, and vessels in transit, were also raised as issues of concern. Close surveillance during major events was mentioned, for example political events taking place in port cities.

The use of EO data for undertaking periodic inspections was discussed. The possibility of using archive data as a means of evidence and verification was raised, as was the use of such data for historical trend analysis.

The use of satellite images over wide areas allows authorities to reduce the area of surveillance for other assets, for example in search and rescue operations or to detect vessels that may not be reporting because they are engaged in illegal activities. In these cases, detecting a non-reporting vessel may provide a target for other assets to investigate, while no detections of non-correlated vessels may mean that resources can be concentrated on searching in areas not covered by the satellite image.

II. Detection of specific types of vessels or activities

Correlation of different data streams was discussed. Detecting non-reporting vessels and rendezvous at sea are important issues for maritime authorities. It was stated that tracking unusual activity along the coastline can help monitor traffic activity and illegal, unreported and unregulated fishing.

The continuous monitoring of an area and the use of time-series to discriminate detected non-reporting vessels from false detections caused by icebergs was reported by Danish participants. Detection of small vessels in busy areas is also of concern when looking for non-reporting vessels. Finnish participants expressed the wish to be able to understand the type of target approaching ports, for inspection purposes. Other areas where close maritime surveillance is requested by participants include fisheries, illegal scientific activities, disaster relief, hijacked vessels and vessels stationed or departing a certain location.

III. Identification of vessels or vessel details

High resolution optical images can provide detailed true colour images which may assist authorities in identifying specific vessels (e.g. by colour, length, distinguishing features), or different types of vessel

(e.g. fishing vessel, cargo vessel, etc.). The possibility of using optical images to gather information on objects on deck was also raised, e.g. illegal cargo, hostages, armed men.

IV. Close surveillance of a vessel of interest

The CMS service is considered a major asset when searching for the location of a non-reporting vessel. Advantages and limitations of the services were discussed.

Participants asked about the capabilities to monitor and follow up a particular vessel of interest, receiving images every few hours along the vessel track. The possibility of using satellite data as evidence in a trial was also discussed.

Regarding the limitations of the services, some participants stated that 24/7 services year round would be beneficial.

The participants were also interested in the possibilities of some sort of alert mechanism or automatic behaviour monitoring based on the vessel and activity detection of the image.

7.4 Plenary

The results of the breakout sessions were presented in plenary by rapporteurs from each of the groups (Session 1: Michela Corvino, EMSA; Session 2: Miguel Bessa Pacheco, Portuguese Navy; Session 3: Daniel Reuter, German Navy).

Following a presentation of the results, two polls were conducted using the audience interaction tool, to discover which of the common issues addressed in the various breakout sessions were of most interest all participants. Each participant was requested to submit up to three responses. The percentages displayed below show what proportion of the online participants selected each of the options provided.

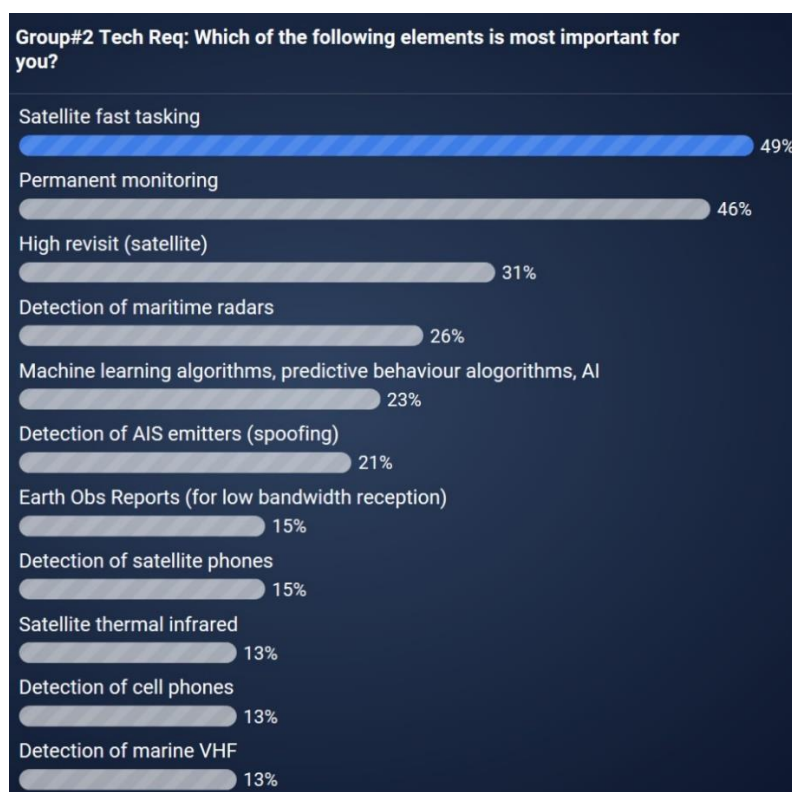


Figure 5: Responses to the poll 'Which of the following elements is most important for you?'



Figure 6: Responses to the poll 'Which of the following use cases is most interesting for you?'

8. Workshop Summary and Conclusions

Leendert Bal, Head of Operations, EMSA, thanked the participants for their active contributions during the Workshop. Special thanks were offered to the range of presenters who either offered an interesting start to the Workshop by reflecting on some of the major trends in Maritime Security or who provided interesting insight into their various uses of the CMS service. The rapporteurs were noted as having contributed substantially to ensuring that the break-out session ran smoothly and captured all the concerns and key observations of participants.

Mr Bal emphasized that the future of the service and its evolution in line with user needs is dependent to a large extent on the collaboration and active involvement of users and other authorities active in the maritime domain, and occasions such as the Workshop provide an excellent opportunity for EMSA to identify priorities for the coming period. A brief overview was given of how the CMS service is likely to evolve in the context of the future Copernicus Programme (2021-2027), and the key role of continuation of services to users and driven by users was reaffirmed.

Providing a final opportunity to participate, users were asked what actions EMSA could take to better support Maritime Security needs through CMS. These responses will be taken, along with the output from the breakout sessions and other data collected across the course of the day and will be reviewed in order to provide input into the continued improvement and evolution of the service. The results are shown below in a word cloud.



Figure 7: Word cloud responses to the question 'What actions could EMSA take to better support your maritime security needs through CMS?'

In conclusion, participants were encouraged to contact the CMS team at EMSA on copernicus@emsa.europa.eu at any time with questions and comments and were wished safe journeys onwards from the Workshop.

List of Annexes

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Annex 2	Agenda
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Annex 1: Acronyms

AIS	Automatic Identification System
AOI	Area of Interest
CMS	Copernicus Maritime Surveillance
CSDP	Common Security and Defence Policy
DG GROW	European Commission's Directorate-General for Internal Market, Industry, Entrepreneurship and SME (Small and Medium Enterprises)
EC	European Commission
EEAS	European External Action Service
EMSA	European Maritime Safety Agency
EO	Earth Observation
EU	European Union
EU NAVFOR	European Union Naval Force
EU SatCen	European Union Satellite Centre
EUMSS	European Union Maritime Security Strategy
GMES	Global Monitoring for Environment and Security
GMCP	Global Maritime Crime Programme
GoG	Gulf of Guinea
HAPS	High Altitude Pseudo-Satellites
IMS	Integrated Maritime Services
IUU	Illegal, Unreported and Unregulated Fishing
NEMO	Navy's Exercise for Maritime Operations
RPAS	Remotely Piloted Aircraft Systems Services
SAR	Search and Rescue
SAR	Synthetic Aperture Radar (satellite sensor)
SEA	Support to External Activity
UN	United Nations
UNODC	United Nations Office on Drugs and Crime
VDS	Vessel Detection System
VHF	Very High Frequency
VMS	Vessel Monitoring System

Annex 2: Agenda

Tuesday, 14 May 2019

Time	Agenda Item
08:45 – 09:00	Registration and coffee
09:00 – 09:30	Workshop Opening <ul style="list-style-type: none"> Opening address <i>Maja Markovčić Kostelac, Executive Director, EMSA</i> Welcome from the Chair <i>Leendert Bal, Head of Department: Operations, EMSA</i>
09:30 – 10:30	Setting the scene: Maritime Security <ul style="list-style-type: none"> Recent developments in piracy <i>Diego Canovas-Canovas, EUNAVFOR</i> Recent developments in international maritime crime <i>Joana Fundo, EUROPOL</i> EU Maritime Security Strategy <i>Ezio Lama, European External Action Service</i>
10:30 – 11:00	Copernicus Maritime Surveillance Service <ul style="list-style-type: none"> Copernicus Programme & Copernicus Security Services <i>Rui Meneses, DG GROW</i> Copernicus Maritime Surveillance <i>Pedro Lourenço, EMSA</i>
11:00 – 11:30	Coffee
11:30 – 12:50	User Presentations <ul style="list-style-type: none"> Marinha Portuguesa - Portuguese Navy <i>CDR Luís Miguel Cardoso Pécio Bessa Pacheco</i> Armada Española - Spanish Navy <i>CDR Alejandro Cervantes</i> United Nations Office on Drugs and Crime Global Maritime Crime Programme (UNODC GMCP) <i>Giuseppe Sernia</i> Wasserschutzpolizeien der Länder - German Waterways Police <i>Hartmut Neumann</i>
12:50 – 13:00	Introduction to afternoon break-out sessions
13:00 – 14:00	Lunch
14:00 – 15:30	Break-out sessions <ul style="list-style-type: none"> CSDP/EU missions Technological requirements Use cases
15:30 – 16:00	Coffee
16:00 – 17:00	Plenary feedback and workshop conclusions
17:00 -	Post-event gathering

Annex 3: List of participants

First Name	Last Name	Organization	Country
Ivelin	Naydenov	Executive Agency Maritime Administration	Bulgaria
Nikolay	Monev	Regional Directorate of Border Police-Burgas	Bulgaria
Martin	Ahl	Royal Danish Navy Command	Denmark
Mikko	Leminen	Finnish Border Guard	Finland
Petteri	Salli	Finnish Border Guard	Finland
Pietari	Vuorensola	Ministry of the Interior, Border Guard Department	Finland
François	Escarras	Ministry of Defence	France
Pierre	Roty	Ministry of Defence	France
Ronan	Chastanet	SGMer	France
Olaf	Juhl	Federal Police	Germany
Daniel	Reuter	German Navy	Germany
Hartmut	Neumann	German Waterwayspolice Coordination and Reporting Centre	Germany
Matthaios	Rizitis	Hellenic Coast Guard Hqs/Security and Sea Borders Protection Directorate/Department of State Security	Greece
Giuseppe	Sernia	United Nations Office on Drugs and Crime	Italy
Askolds	Pukjans	The State Border Guard of Latvia	Latvia
Andrzej	Aleksandrowicz	Maritime Office in Gdynia	Poland
Adam	Roszkowski	Maritime Regional Unit of Polish Border Guard	Poland
Fernando	Braga	DGRM - Portuguese Maritime Administration	Portugal
Ana	Faneca	DGRM - Portuguese Maritime Administration	Portugal
Rui	Serafim	DGRM - Portuguese Maritime Administration	Portugal
Luís	Branco	Portuguese Navy	Portugal
Caldeira	Carvalho	Portuguese Navy	Portugal
Bento	Domingues	Portuguese Navy	Portugal
Bento	Domingues	Portuguese Navy	Portugal
João	Ferreira	Portuguese Navy	Portugal
Manuel	Honorato	Portuguese Navy	Portugal
Paulo	Lourenço	Portuguese Navy	Portugal
Miguel	Pacheco	Portuguese Navy	Portugal
Vasco	Prates	Portuguese Navy	Portugal
Luís	Quaresma dos Santos	Portuguese Navy	Portugal
Filipe	Rei	Portuguese Navy	Portugal
Ana	Reis	Portuguese Navy	Portugal
Ana	Trindade	Portuguese Navy	Portugal
Oprescu	Mircea	Romanian Border Police	Romania
Tiberiu	Calboreanu	Romanian Naval Authority	Romania
Marko	Grabljevec	Luka Koper d.d.	Slovenia
Marko	Kuthe	Luka Koper d.d.	Slovenia
Peter	Maglica	Luka Koper d.d.	Slovenia
Carlos	Lopez	AEAT/ Spanish Customs	Spain

Úrsula	Usanchez – Reseco Lá Pez	General Directorate of Marine Affairs	Spain
Alejandro	Cervantes	Spanish Armada	Spain
Henk	Rohaam	Netherlands Coastguard	Netherlands
Lisette	Van Oss	Netherlands Coastguard	Netherlands
Peter	Smith	Maritime and Coastguard Agency	United Kingdom
Ricardo	Barragan	EUNAVFOR	
Elisabetta	Pietrobon	EC-GROW	
Rui	Meneses	EC-GROW	
Joana	Fundo	Europol	
Diego	Canovas	EUNAVFOR	
Ezio	Lama	European External Action Service	

First Name	Last Name	Organization
Leendert	Bal	EMSA
Michela	Corvino	EMSA
Catrin	Egerton	EMSA
Pedro	Lourenço	EMSA
Maja	Markovčić Kostelac	EMSA
Paula	Marti	EMSA
Helena	Ramon Jarraud	EMSA

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