



EMSO ERIC ANNUAL REPORT 2019



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EXECUTIVE SUMMARY

This Annual Report covers the EMSO ERIC activities in the period 1 January - 31 December 2019. It represents the major findings and results achieved.

The European Multidisciplinary Seafloor and Water Column Observatory (EMSO) is a European Research Infrastructure Consortium (ERIC) founded as of on 1 October 2016, becoming an international organization with its own legal status and Statutes published on the Official Journal of the European Union L268/113. EMSO ERIC as distributed research infrastructure is promoting scientific excellence, coordinating and integrating European deep-sea observation facilities that provide interdisciplinary scientific investigations in marine geology, geophysics, physical oceanography, marine meteorology, geochemistry, biochemistry and linked topics.

Significant progress was made in governance, such as the approval of the Term of Reference (ToR) of the ExCom, which describes its function and tasks within EMSO, and also finally, the new SG "Innovation and industry" has been established. The 2019 Work Programme established at the end of 2018 was put into operation since the beginning of the year, becoming a fundamental tool in monitoring the activities throughout the year. Within the framework of the objectives achieved we highlight an analysis of the facilities and location of the sites which was carried out, based on specific growth criteria in order to expand the EMSO ERIC facilities. In this first analysis, the facilities of the FixO3 EC project were included, because they already meet the requirements to be part of the EMSO expansion. The DG also initiated links for a close collaboration with European Research Vessel Operators (ERVO) in order to establish collaborative synergies in the deployment and maintenance of equipment. It is also worth mentioning the substantial progress made in terms of scientific services: in Spring 2019 the first draft of the Scientific Services catalogue was delivered, where the scientific services and the capacity of the different RFs are described. The SSG identified and developed scientific workflows, specifically for the Operational Oceanography and Climate case, to provide long-term time series data sets for multiple Essential Ocean Variables (EOVs). Moreover, a preliminary catalogue of capabilities to record seismic and geo-hazard data at specific EMSO RFs has been achieved. With the incorporation of IT official, advances in Data Management Platform (DMP) have been very important. During the summer of 2019, a pre-production (test) EMSO ERIC DMP environment configuration was reached, subsequently the DMP was implemented which has been extensively tested and developed based on comments from the data services group and other parties. The activity within the ELSG has continued to progress both in the extension of best practices and in the tests of the calibration bench for a final configuration and tuning of the human-machine interface, with some key achievement in the Dissolved Oxygen sensor calibration. The communication and outreach activity has been enormous throughout the year, EMSO has actively participated, organizing scientific-technical sessions, in events and meeting of European and world impact relevance, such as EGU and AGU among others, notably increasing EMSO ERIC visibility in the media and the social media.

During 2019 EMSO ERIC also finalized the European Trade Mark registration, the DPO appointment and the ISO 9001 certification process (approved in 2020).

1. GOVERNANCE

ORGANIZATION

The governance structure was reinforced in 2019, EMSO ERIC focused on finalising its implementing rules complying with the Statutes to adopt them.

The Central Management Office (CMO) Terms of Reference (ToR) updates the version of IMPLEMENTATION RULE 8 - CMO voted and approved by the Assembly of Members (AoM) at its first meeting (October 1st, 2016). This document includes additional details on the functions of the CMO. It also clarifies the complementarity of the CMO and the SGs. It was approved by the AoM in November 2019.

Moreover, the ExCom ToR, updating and integrating the IMPLEMENTATION RULE 9: "The Executive Committee", was finalised in August and approved by the AoM in November 2019. This document details the internal workflow outlining ExCom operations. Mandate, composition, ToR of the ExCom and their role within the ERIC are reported.

The new SG "Innovation and Industry" has been established.

Long-term sustainability

EMSO ERIC addressed the need for establishing a shared and planned "growth path" to strengthen its effectiveness as a pre-condition for long-term sustainability.

The analysis of new potential facilities to be included within the RI and resulting maps with different scenarios were carried out in 2019. The definition of specific growth criteria accompanied this analysis, and elements for growth policies have been outlined. This work has been done in parallel and accordingly with the implementation of the EMSO Label. The processes have been designed to add value to existing RF capabilities and diversity and increase the demand from researchers in the fields of cutting-edge science and technology. EMSO is aimed at integrating the existing fixed-point ocean observatories around Europe. The distributed RI represents a great added value due to the scalability from local to regional in the use and characterization of deep-ocean observations, as well as a value is the acquisition of physical, biogeochemical, and biological data operated in an open approach based on Best Practices. Moreover, maintaining and investing on existing structures, encouraging the coalition of independent groups, communities and networks are the key concepts underpinning the Framework for Ocean Observing which EMSO fully embraces by its nature, allowing its activities and programmes to be potentially integrated into a wider global system.

The first Report on "The Map of Potential Additional EMSO ERIC Observatories", owned by the current EMSO Members, was submitted at the 9th AoM (April 16th, 2019). It describes the defined process to increase the number of EMSO ERIC observatories. The EMSO ERIC Director General (DG) assisted by the CMO, and the ExCom have been the main actors driving this process.

The first step addressed the facilities belonging to the Member Countries. These facilities have been grouped in:

- Facilities operated by Representing Entities;
- Facilities non-operated by Representing Entities.

The first subset of facilities selected from these two categories have been those previously defined in the EC project ESONET-NoE and those participated to the EC project FixO3, as the result of the Project provided EMSO with a useful indication for the maturity assessment. Consequently, the process of integrating additional observatories started with those responding to the minimum level of maturity and the scientific criteria defined by the Science Service Group (SSG) and the access status assessed by the mean of the mapping. A dedicated roadmap has been outlined to accelerate the growth process of EMSO fostering its membership and increasing the number of observatories. Procedures and processes have been defined to incorporate new RFs from EMSO Members, and EMSO will fulfill first results in 2020. The roadmap is a living document aimed at consolidating synergies and boosting the link with Countries already EMSO ERIC Full Members and attracting new Members.

A new funding model proposed on the November 18th, 2019 to the AoM upon their request, in order to guarantee the long-term sustainability of the infrastructure. To this end a new mechanism to secure funding from the Members for 5-years periods was proposed to the AoM in 2019 and summarized in the doc “Sustainability issues and funding models”. The new decision-making process proposed for securing the Members contributions links this contribution to the approval of the multi-annual programme and budget (5 years) and suggests a new methodology to calculate the fee of each Member, based on a mixed flat rate/GDP model, to allow all Members and the new ones to join on a fair basis, ensuring a minimum contribution from all the Members equal for all.

The EMSO ERIC Work Programme for 2020 (see the roadmap in Figure 1) was elaborated at the end of 2019, with the addition of the Work Plan of the new Innovation and Industry SG. The Work Programme 2020 architecture translates the strategic objectives into concrete actions. The activities are carried out integrating the contribution of the different SGs, that are working to reach the EMSO ERIC full operative phase. The Work Programme also integrated the activities of the funded projects, linking them to the achievement of EMSO ERIC strategic objectives. Two particular cases deserve a mention:

1. The optimization of the resources to achieve the development of integrated data management services, with the inclusion of the RFs into the EU Project ENVRI-FAIR (EOSC Cluster Project). This was endorsed by the AoM as an excellent opportunity for the ERIC to show RFs the great added-value of integration and coordination. ENVRI-FAIR was connected to the Work Programme 2019 strategic objective “Develop integrated data management services” and integrated with the activity of the Data Management SG. This mechanism is a concrete example of the optimization of the resources to achieve EMSO strategic objectives.
2. The participation to the ERIC-Forum as an opportunity to frame the collaboration with the other ERICs. The ERIC Forum aims at strengthening the coordination within the ERIC community and enhancing collaboration between partners. The strategic approach of the ERIC Forum will contribute to address critical challenges, develop best practices and frame the necessary knowledge to support ERICs-to-be with various aspects. Moreover, this will contribute in building the brand identity of ERICs as an important body and stakeholder in consultation of related policy action.

TASKS	2019				2020				2021			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
OBJECTIVE 1 - CONSOLIDATE ALL SERVICES												
1.1 Launch the EMSO Label												
1.2 Service Level Agreements signature and follow-up												
1.3 Ensure access												
1.4 Plan and provide trainings												
OBJECTIVE 2 - CONSOLIDATE SCIENCE SERVICES												
2.1 Setting up of the EMSO science strategy												
2.2 Define workflows for core science services												
2.3 Develop Science Services access												
OBJECTIVE 3 - CONSOLIDATE DATA SERVICES												
3.1 Deliver CMO information technology and data services												
3.2 Enhancing the harmonization and FAIRness of EMSO ERIC data												
3.3 Delivering EMSO ERIC data services												
3.4 Development of data-related services, tools and expertise on cross-service group activities												
3.5 Improve harmonization between EMSO-ERIC and the global Eulerian observatory network (OceanSITES)												
OBJECTIVE 4 - CONSOLIDATE ENGINEERING AND LOGISTIC SERVICES												
4.1 Setting up of the EMSO technology strategy												
4.2 Setting up of the EMSO maintenance												
4.3 Establish a permanent dialogue with European research fleet												
4.4 Operational EGIM procurement process												
OBJECTIVE 5 - CONSOLIDATE COMMUNICATION SERVICES												
5.1 Set-up the EMSO ERIC Communication Plan to coordinate internal and external communications												
5.2 Increase the international visibility and use of EMSO products												
5.3 Harmonize key ERIC messages												
5.4 Increase the engagement with not specialized audience												
5.5 Contribute to the design and execution of the communication, activities aiming to foster and strengthen links with industry												
OBJECTIVE 6 - CONSOLIDATE INDUSTRY AND INNOVATION SERVICES												
6.1 Assess the current readiness level of EMSO ERIC facilities, in regards to Innovation and Industry-Liaison and prepare an integrated EMSO-ERIC Innovation and Industry Strategy and Action Plan												
6.2 Set up a support framework for successful innovation relationships with industry												
OBJECTIVE 7 - ENSURE SUSTAINABILITY												
7.1 Set-up phase review												
7.2 Strategy for EMSO ERIC consolidation phase												
7.3 Harmonisation and Integration of Regional Facilities												
7.4 Set up EMSO ERIC strategy for attracting new members												
7.5 Definition of EMSO ERIC funding strategy												
7.6 Establish risk governance framework and sustainable long-term funding												
7.7 Identify ERIC's accounting framework activities												
7.8 Reinforce the links with international counterparts and relevant stakeholders												
ADMINISTRATION												
1. Setting up of a provisional balance sheet and IS real time system												
2. Start of ISO certification activities												
3. Simplify and make more efficient the overall management of the Accounting through the external consultants												
4. GDPR implementation status												
5. Provisional budget by October of the previous year												
6. Provisional balance sheet by March of the previous year												

Figure 1 Work Programme 2020 Roadmap

The mapping exercise was designed as a management tool aimed to add value to RFs, to fill out the EMSO services, by working to integrate and harmonize EMSO strategies across the RFs. The approach started in 2017 by examining the existing capabilities of the RFs and identifying practical actions to achieve critical EMSO objectives. The process started since the EMSO All Regions Workshop in mid-October 2017, in which the EMSO-Link project management in coordination together with the EMSO-Link WP Leaders (in particular, WP2-IFREMER, WP4-NERC/NOC and WP8-CNRS) started the 'mapping activities' of the EMSO ERIC RFs and to define the status and the resources available. This was a good starting point to identify the services. In 2019 the mapping activity drove the "Report on maintenance procedures"; the "First update of the operational and capital expenditure report".



In 2019 the EMSO ERIC DG strengthened the coordination and co-operation with key EU and International actors. On April 29th, 2019, the MoU with LifeWatch ERIC was signed to strengthen their cooperation. They have agreed to join forces in designing and implementing ambitious joint research projects and collaborative initiatives, which will result in positive outcomes for the both related research areas.

Figure 2 Signature of the MoU EMSO ERIC - LifeWatch ERIC

The DG also promoted a strong collaboration with the European Research Vessels Operators (ERVO) to reinforce the coordination capacity of the maintenance of EMSO RFs. Figure 3 shows the key networks and projects related to ERVO.

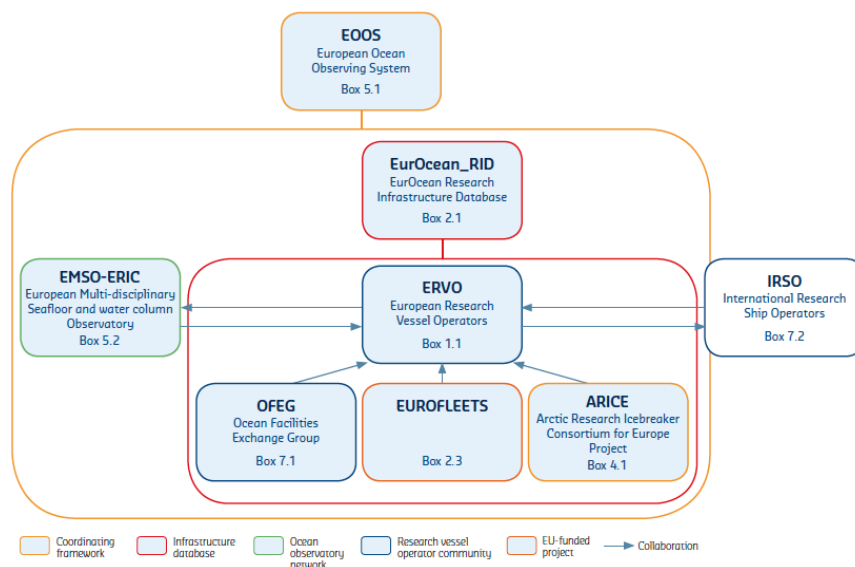


Figure 3¹ Overview of key networks and projects related to ERVO

¹ Nieuwejaar, P., Mazauric, V., Betzler, C., Carapuço, M., Cattrijse, A., Coren, F., Danobeitia, J., Day, C., Fitzgerald, A., Florescu, S., Ignacio Diaz, J., Klages, M., Koning, E., Lefort, O., Magnifico, G., Mikelborg, Ø., Naudts, L. (2019) Next Generation European Research Vessels: Current Status and Foreseeable Evolution. Heymans, JJ., Kellett, P., Viegas, C., Alexander, B., Coopman, J., Muñiz Piniella, Á. [Eds.] Position Paper 25 of the European Marine Board, Ostend, Belgium. 140pp. ISBN: 978-94-92043-79-5 DOI: 10.5281/zenodo.3477893

OPERATION

The Service Level Agreements (SLA) (general part and the two schedules) with the facility owner(s) were part of a long process. The finalization of the document and the signature process will be conducted in 2020.

Services design and implementation

1. Science services

The Science SG (SSG) produced the first issue of the "EMSO Science Service Catalogue" in May 2019 (see **Appendix 1**). This catalogue provides a detailed description of currently offered science services. It is a key internal document that boosts the collective awareness of the ERIC Members on the status of the distributed infrastructure, informs on EMSO communication strategy, and serves as a tool to identify, for each service, or category of services, the steps required to upgrade it/them to EMSO desired standards. In terms of its internal organisation, the SSG has, as early as its kick-off meeting, decided to identify theme leaders among its members, to take care of the implementation and upgrades of each category of services. These theme leaders have been closely involved in preparing the science service-related workflows: Geo-hazards, Operational Climate and Oceanography, Statutory Monitoring such as MSFD and integrative research.

The huge work carried out in 2019 will be finalized in 2020. Particularly, we have drafted, the operational Oceanography and Climate workflow that can provide high-resolution long-term time series datasets for multiple EOVS and other parameters. EMSO ERIC is providing services that add value to the collection of operational climate and oceanography data. In relation to Geo-hazards, a preliminary catalogue of capabilities has been drafted, which is the basis for defining the EMSO scientific services. The most widely collected geographic hazard data at EMSO are seismic data at Ligurian Sea, Western Ionian Sea, Hellenic Arc, Azores and also at OBSEA shallow-water testbed.

The SSG proposed to form task groups for each science service category, with members nominated by each of the other SGs.

EMSO-related sessions were organized at the EGU-European Geosciences Union (using and acquiring monitoring data to enhance the knowledge of key oceanic processes and their interactions). A session organized and co-chaired between EMSO ERIC and ONC-Canada within the AGU-American Geophysical Union entitled "Cooperative research strategies for ocean observatory infrastructures to support the UN Decade of Ocean Science for Sustainable Development". This session brought together cabled organizations and other fixed-point ocean observatory infrastructures to exchange and coordinate observing strategies that contribute to the goals of the UN Decade. Community-based ocean observation programs and infrastructures were also featured. Invited talks included infrastructure leaders and operators, early career scientists, and social end users of ocean observations.

2. Engineering and logistic services

The EMSO ERIC engineering and logistic services continued to be developed in 2019, the result of this huge work will be achieved in 2020. Long-term quality and save marine observation can be achieved by implementing technologically advanced sensor and communication systems in accordance with scientific-technical requirements. This undoubtedly requires an excellent organization, means and procedures to adapt it to the needs and a perfect synchronization in the execution. It is clear that the long-term operating cost of distributed infrastructure operations is a significant in overall infrastructure context and therefore requires

very rigorous planning on the part of EMSO ERIC. In this context, events such as the Toulon workshop have been organized in order to discuss methodologies, exchange good practices and think at a European level about the optimization of maritime operations.

Dissolved Oxygen sensor calibration bench

During 2019 the calibration bench was sent for a final set-up and fine-tuning of the Man Machine Interface. The EMSO ERIC Engineering and Logistics SG is in charge of exploiting the bench and several operation scenarios are currently studied.

Handbook of best practices

In 2019 a third chapter on the intervention on ocean observatories was developed. This work is the result of the Workshop on Seas Operations for Ocean Observatories, organized in Toulon on 25-26 September 2019. 65 participants from 11 countries attended the workshop during which 21 presentations were given (see Figure 4 for a picture of the participants). The workshop included 3 oral/poster sessions plus a hands-on demonstration in a single-track format over two days. The oral sessions mixed talks from solicited speakers and talks selected after abstract submission:

- Best Practices for intervention on observatories using underwater robots:
 - Methodologies for the installation and dismantling of heavy underwater infrastructures,
 - Methodologies for deployment, recovery and in situ maintenance of scientific equipment;
- Hands-on session on operational systems, demonstrations on (more details in training chapter):
 - HROV Ariane,
 - Scientific Junction Box (SJB);
- Best Practices for intervention without robots on underwater observatories:
 - Intervention procedures from ships,
 - Intervention procedures with divers;
- Perspectives:
 - Technical innovations for cost reduction and for avoiding the use of disposable ballast,
 - Mutualisation of heavy means for servicing observatories.



Figure 4 Workshop on Sea Operations for Ocean Observatories, Toulon, September 26th, 2019

The Handbook of Best Practices was enlarged with the description and characterization of the underwater observatories, as well as an analysis of the different types of intervention, from site survey, deployment of modules, cables laying, maintenance, inspection, recovery or relocation. The resources and procedures for intervention were also included.

3. Data management services

The focus in 2019 was on deploying a Data Management Platform (DMP) (Figure 5) and transitioning it to pre-production for testing and evolution before starting its operation in production. It includes a number of tools as described below.

The (interim) production EMSO ERIC data access services were operated without incidents and refinements were implemented. EMSO ERIC continued the engagement with European Grid Infrastructure (EGI) for transitioning from EMSODEV project developments to EMSO ERIC operations. The initial discussions included access to significant resources during the summer of 2019; however, EMSO ERIC was encouraged to apply to the EOSC-Hub Early Adopter Programme (<https://www.eosc-hub.eu>) to enable resource providers with sufficient funding to support and sustain the necessary resource allocations. EMSO ERIC responded to the call in June 2019 with a proposal that, after developing a technical plan with EGI, and was awarded in early November.

During the summer of 2019, EGI provided a small set of resources that have been used for setting up the pre-production (testing) EMSO ERIC DMP environment. Following a prototyping strategy, EMSO ERIC deployed the DMP that delivers essential building blocks. Open source solutions that are widely adopted by the community have been employed, when it has been possible.

The DMP has been comprehensively tested and it was evolved based on feedback from the data service group and other EMSO stakeholders. The initial architecture of the EMSO ERIC data management platform is illustrated in the figure below and the different components are briefly described as follows.

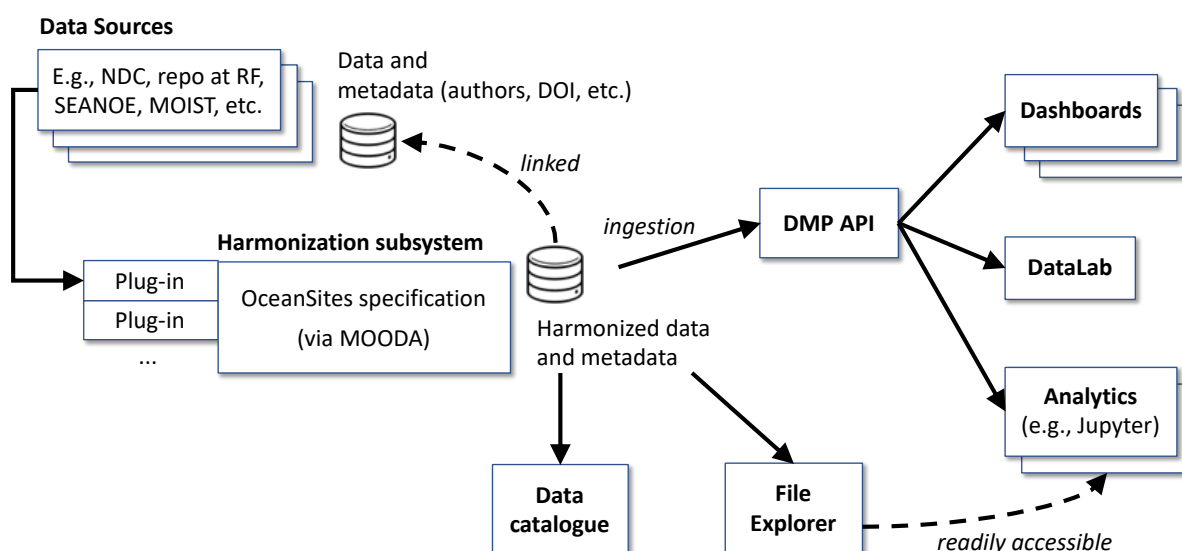


Figure 5 Overview of the EMSO ERIC Data Management Platform (DMP)

The data sources are provided by the RFs, which deliver data and metadata according to their existing processes and practices; however, these processes are not homogenous across RFs. The approach is based

on respecting the data workflows at the regional facilities and providing harmonization at a higher level of abstraction. As a result, in the current implementation the RFs provide access to the data sources through the mechanism of their choice, national data centers (e.g., BODC), dedicated services (e.g., ERDDAP, THREDDS server) or third-party repositories (e.g., SEANOE, MOIST, EMODNet). This strategy facilitates fast delivery and reduces potential risks associated with the significant efforts required to modify the data already deposited in repositories. Metadata sources include key attributes such as DOI, authors which are propagated along the data lifecycle, maintaining links to the actual data sources.

The main goal of the harmonization subsystem is providing harmonization across EMSO ERIC data sources according to FAIR (Findable, Accessible, Interoperable, Reusable) principles and EOSC (European Open Science Cloud) guidelines. This is an important requirement of the ENVRI-FAIR project. The implementation of the harmonization subsystem has adopted key outcomes of the EMSODEV project such as the Module for Ocean Observatory Data Analysis (MOODA) and is based on the OceanSites specifications.

The harmonization subsystem acquires and processes data and metadata through extensible and flexible plugins that are tailored to the different data sources. The Data Portal provides access to EMSO ERIC data focused on EOVs and data tools provide different functionalities such as visualizations and analytics (see Annex I).

4. Communication Services

❖ EMSO ERIC website

The website has to be considered as a living instrument. During 2019 it was regularly updated also with the creation of new and relevant sections. The numbers of viewers has grown in 2019 and their spatial distribution also spread all over the world (Table 1, Figure 6).

	2019
<i>Users</i>	4.335
<i>Sessions</i>	7.146
<i>Average Session Duration</i>	00:02:03

Table 1 *The viewers' number, the sessions' number (interaction's numbers with the web pages) and average duration for the sessions*

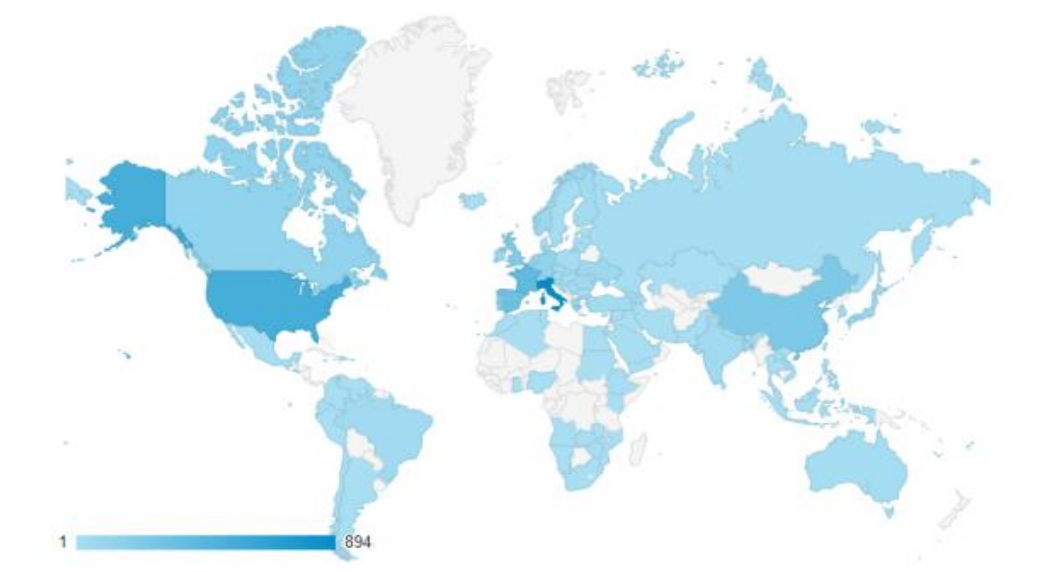


Figure 6 Viewers' spatial distribution

Many different media and social media have been carried out (see Annex II).

Other activities to promote and provide visibility to EMSOERIC are related to exhibitions, conference, workshops and training, a detailed list of the essential activity is in Annex III.

Access

Enabling infrastructure access is one of the core drivers for the formation of ERICs, including EMSO. Through the EMSO-Link project, EMSO ERIC initiated one call of multi-site Transnational Access (TA). The objective of this call is to offer free-of-charge access to three EMSO ERIC RFs where external measuring systems can be installed, including instruments, systems, new technologies and where new procedures/experiments can be tested/take place. The list of observatories offered for TA is designed to offer the broadest scientific and technological capabilities to future users in the framework of TA.

The selection process was carried out in 2018, resulting in four projects selected (Table 2).

TNA Observatory	Obs Manager	Affiliated Institution	Proposal Name	Proposal Description
EMSO- NICE	Xavier Bompais	IFREMER	MODAL	<p>MOntoring seafloor Deformation and Assessing Landslide hazards associated with pressures(Nice slope)</p> <p>Theme: Geohazards & Geological Processes</p>
EMSO- PYLOS	George Petihakis	HCMR	DISAG	<p>Detection of Increased Seismic Activities by Gradients</p> <p>Theme: BioGeoChemistry & Geohazards</p>
			IMAPOCEAN	<p>Integrated Multilevel Active and Passive Oceanographic Current Education Advancement Network.</p> <p>Theme: Physical Oceanography</p>
EMSO- SmartBay	Allan Berry	MI	SmartLobster	<p>Norway lobster (<i>Nephrops norvegicus</i>) population dynamics from automated video-monitoring at SmartBay cabled underwater observatory</p> <p>Theme: Ecology & photo/video time series</p>

Table 2 Selected TA projects

In 2019 the activity concentrated on defining the legal framework for accessing the RI. After the final selection was announced, applicants were contacted directly by the Observatory Manager. Additional information/guidelines were provided and to the teams began negotiating and drafting terms for the EMSO ERIC TNA agreement. The agreement delineates the actions, the resources, the length of planned user stays if any, and the period of use. It also defined the rights and obligations of the Parties involved, including provisions for force majeure or early termination.

Once terms and conditions of the TA agreement were completed, the legal representatives from Applicant and Observatory Manager institutions signed and send to the EMSO ERIC TA Office for final signature. The MODAL Project started in August 2019. MARUM and IFREMER teams successfully deployed a sensor station, named KATERINA. The successful connection of the station to the EMSO-Nice cabled observatory allowed remote configuration of the monitoring system so that in situ data are now effectively accessible in real time at MARUM located in Bremen, more than 1000-km away. The deployment of the KATERINA station and sensors occurred from August 20 to 23, 2019 in the frame of the EMSO-Link project which granted TA to MARUM as a service provided by the EMSO ERIC. Deployment operations at sea were carried out from the R/V L'Europe as part of the FLUID3D-2 cruise and the ANR-MODAL project. The support of divers from IFREMER was key to achieve cable deployments and underwater operations as required to connect the KATERINA station to a junction box of the EMSO-Nice cabled observatory.

Sebastien Garziglia (IFREMER) who was the mission chief indicated that "The radioactivity sensor together the CTD sensors (conductivity-temperature-depth) now installed in the KATERINA station will record data relevant to the understanding of the temporal variability of fresh groundwater discharge. This approach adds

to fluid pressure monitoring in the sediment which initiated 10 years ago as a means of assessing the factors affecting the susceptibility of the area to failure”.

EMSO-Nice observatory manager Xavier Bompais (IFREMER) explained that “The operations were carefully planned by IFREMER and MARUM teams. The connection of the instruments and transmission of the data they collect was tested and validated in June in our laboratory”.

One single planned operation was not completed during the FLUID3D-2 mission. It was the deployment of a seismo-piezometer probe from MARUM which aimed at measuring the pore fluid pressure together with ground motions in the sediment nearby the KATERINA station. Despite two attempts, the lance like probe could not penetrate hard grounds.

Training

The objective of the EMSO ERIC training during 2019 was to train EMSO staff and users in sea operations to stimulate the integration and the diffusion of the technical aspects among RFs and across disciplines. The aim was also to continuous progressing within the EMSO Label which is a fundamental best practices tool at all level from engineering and sensors to data management and data harmonization A secondary goal is to reach out to a wider public to promote awareness of marine sciences and technologies.

During the "[Workshop on Sea Operations for Ocean Observatories](#)", held in Toulon (France) on 25-26 September 2019, hands-on training sessions devoted to functional demonstrations of operational systems were organized:

- a) IFREMER's HROV Ariane in a test basin. Intervention capabilities of the robot, equipped with specific tools for underwater intervention on a cabled observatory;
- b) Scientific Junction Box (SJB) dedicated to environmental sciences on the EMSO Western Ligurian Observatory and its scientific equipment.

2. FINANCIALS

NOTES TO THE FINANCIAL STATEMENTS

1. Foreword

EMSO ERIC is a not-for-profit legal entity/international organization undertaking mainly non-economic activities which relate to research activity which started its activity in 2016. Since then, EMSO ERIC has shown a continuous growth of Revenues essentially due to the increase of the number of EC funded projects while the contributions from the Member States has been constant (Table 3). It should be noticed the receipt on March 31st, 2020 of the request of admission of a new Member State: Norway.

ACRONYM	BUDGET EMSO ERIC	REVENUES 2017	REVENUES 2018	REVENUES 2019	Revenues 2020	Balance 2021- 2022
EMSO-Link	539.926	91.266	214.377	234.284	84.957	-
DANUBIUS-PP	47.187	7.960	16.255	22.972	12.264	-
ENVRIplus	92.057	-	25.392	43.403	-	-
ENVRI-FAIR	1.202.876	-	-	148.380	173.502	880.994
ERIC-Forum	44.166	-	-	3.680	21.365	19.121
Eurofleets+	149.500	-	-	45.198	51.770	52.532
Eurosea	27.500	-	-	355	6.702	20.443
ATLANTECO	17.000	-	-	-	3.757	13.243
ENRIITC	109.531	-	-	-	38.077	71.454
Adjustments	-	-	-	47	-	
TOTAL	2.229.743	99.226	256.024	498.319	392.394	1.057.787

Table 3. Evolution of funded EC projects (in euro) until 2019, and projection until 2022

Table 3 effectively shows the overall trend in terms of financial strategy followed by the ERIC. In order to sustain growth, the working capital has been guaranteed by an adequate creation of reserves (cash carry-over) which allowed EMSO ERIC to finance the growth without engaging the ERIC in undertaking debts and obligations towards third parties.

However, the cash carry over has been progressively reducing up to a sustainable level which now allows EMSO ERIC to face its current and medium-term obligations and carry out its institutional activities avoiding to charge the Member States (Table 4).

Year	Cash-carry-over	Revenues	Yearly Cash-carryover/ Revenues
2016	104.124	99.603	105%
2017	235.788	496.560	47%
2018	129.299	754.625	17%
2019	75.052	998.319	8%
2020 (est.)	62.194	892.394	7%
Total	606.457		

Table 4 Evolution of Revenues vs Cash carry-over in Euro

The following year (2020) is expected mark a key milestone in EMSO ERIC growth since the Data and Information services will be operational and a Services Deployment Plan is expected to be reviewed and approved by the AoM during 2020.

EMSO ERIC has relied on its Host Organisation (INGV) which provided a significant financial support which respect to the other Member States but also on the availability of the In-Kind Contributions which have been full used by EMSO ERIC to guarantee the start-up phase. In addition, from 2017 the Spanish Institution CSIC started to provide a significant In-Kind contribution covering the salary cost of the DG (Table 5).

Profile	2019 (in €)	2019 (FTE)	2020 (Est in €)	2020 (FTE)
IN-KIND				
CSIC	84.256	1.0	88.000	1.0
INGV	127.670	1.75 (21 MM)	159.405	2.2 (26 MM)

	211956	2.75	247405	3.2
PERSONNEL	561382	5.78	560200	6.05
TOTAL	773308	8.53	807605	9.25

Table 5 In-kind contribution provided by INGV and CSIC and value of the personnel involved

COVID-19 pandemic effects

The impacts of the current COVID-19 pandemic are presenting challenges for the ERICs throughout Europe since February 2020 but this has been included in the Notes to the 2029 economic financial statements approved in April 2020. EMSO ERIC has been evaluating thinking through these challenges as they work on issuing year-end financial statements. At the moment of the redaction of the 2029 Report EMSO ERIC does not foresee a short-term impact on its operations and financial positions as a result of the COVID-19 pandemic. However, some level of information and predictions will be required to duly inform the AoM of material information that may have an impact on the 2020-2021 financial statements and for periods after the 2019 balance sheet approval date.

Nevertheless, though the short-term expected impact of COVID-19 pandemic on EMSO ERIC is relatively low for the time being, EMSO ERIC must assume that the uncertainty will occur and an assessment of any future effects should be carried out as.

Among the possible assumptions to be assessed there is the impact from any shutdowns or quarantines, the implication of recently issued Italian and European laws, and the status of companies within the supply chain. EMSO ERIC has assessed assumptions and included the related details regarding such assumptions in the Financial Statements projections. Given the rapid changes, EMSO ERIC will closely monitor the on-going assessment, conclusions. In light of the on-going global health crisis, EMSO ERIC has promptly put in place a plan to ensure: (i) the health and safety of the employees and consultants and of those of our service providers, (ii) continuity of essential internal operations, and (iii) limitation of financial impacts and protection of financial liquidity.

2. Accounting criteria

The 2019 annual Financial Statements have been compiled in conformity with the international accounting standards IPSAS (International Public Sector Accounting Standards) issued by the International Public Sector Accounting Standard Board (IPSASB) and in view of being adopted by the European Commission within the meaning of Council Directive No 2011/85/EU of 8 November 2011 on requirements for budgetary frameworks of the Member States.

The voluntary decision to adopt an accounting system that can be connected to international principles is consistent with the process of harmonization started some time ago within the EU Commission and not yet completed. For this purpose, it is relevant to recall the “Report from the Commission to the Council and the European Parliament towards implementing harmonised public sector accounting standards in Member States. The suitability of IPSAS for the Member States”, published on March 2013.

The IPSAS, in general, can function as a basis for harmonised accrual-basis accounting standard passing through their transformation into EPSAS (European Public Sector Accounting Standards). The EU above mentioned Directive states that by December 14th, 2018 the Commission shall public a review of the sustainability of the Directive (see art.16).

EMSO-ERIC is set up as an international organization with scopes of general interests typical of an Entity referable to the Public Sector. Therefore, EMSO-ERIC should be able to relate to its Members in different countries in a common language. This should be adopted in all matters and at all levels and thus also in the model of presentation of economic-financial topics, which support the annual accounts and budgets.

The use of the International Accounting Standards referable to Public Sector, taking into account the specific character and scopes of EMSO-ERIC, adequately conformed to the legal characteristics of the Entity and to its functions and scope, can allow the development of well-defined best practices, whose impact on the financial aspects is measurable and effective. The use of international accounting standards, in fact, allows information on the financial statements to be presented in a common way for users/stakeholders of different nationalities, ensuring that:

- the information is relevant, reliable, comparable and understandable;
- the terminology used is common, appropriate and explanatory among members and for similar international organizations outside Europe;
- the financial statements are auditable by International Standard of Audit by auditors from different nations;
- a host country change - and thus any site change - is not relevant for the comparability of information and models, books, records of the accounting system;
- the accounting system is designed to present the in-kind contribution model, to provide analytical accounting for projects and separate accounting for economic activities.

The aim of the annual financial statements is to provide information on the assets and liabilities, the profit or loss and changes in the financial structure of the Consortium, useful to a wide range of users. The financial statements are prepared within a general-purpose framework.

The financial statements have been compiled in accordance with the principles of clarity and transparency and provide a correct and exhaustive framework of information on ownership relations, as well as economic and financial relations implemented by the Consortium in carrying out its activities.

It has been compiled considering International Accounting Standards for Public Sector entities, integrated in order to be consistent with the legal and effective structure and scopes of EMSO.

The Consortium, in compliance with IPSAS n.1, has chosen to present the layout of the balance sheet, distinguishing between current and non-current items, and the layout of the profit and loss account, classifying expenses by their nature.

- In its drawing-up, the following principles have been observed:
 - ✓ The items have been evaluated prudently, considering the perspective of the continuity of the activities, as well as the economic function of assets or liabilities;
 - ✓ Only incomes and expenditures related to the financial year have been accounted, independently of the day of encashment or payment;



- ✓ The risks and losses related to the financial year have been accounted, on an accrual basis, even if known after the end of the financial year.

These Notes have been compiled in order to clarify, complete and analyse the information contained in the assets and liabilities balance sheet and in the profit and loss account, in addition to providing information on the applied evaluation criteria, on the movements that have taken place and the changes in various assets and liabilities.

The notes are an integral part of the financial statements and provide descriptive and schematic information with particular reference to the ownership aspects, as well as economic and financial aspects of the overall management.

The financial statements comprise the following parts:

- Balance sheet, assets and liabilities statement;
- Profit and loss account;
- Explanatory notes;
- Cash Flow Statement;
- Management report.

3. Evaluation criteria

The financial statements have been compiled in accordance with the principles of clarity and transparency and provide a correct and exhaustive framework of information on ownership relations, as well as economic and financial relations implemented by the Consortium in carrying out its activities. They have been compiled taking into account IPSAS, according and conforming to the legal characteristics of a non-profit international institution and the specific scope of EMSO.

Balance sheet

The items in the balance sheet are classified into non-current/current.

Assets

“Non-current” assets are long-term investments where the full value will not be realized within the accounting year. Examples of noncurrent assets include intangible assets such as intellectual property, plant and equipment.

The non-current assets include tangible assets (such as computers and other minor electronic tools), intangible assets (such a licenses and in general all assets not related to the operating cycle and realizable after 12 months from the balance sheet date).

“Current” assets are assets that can be converted into cash within one operating cycle.

The assets are classified as “current” assets when:

- They have been realized during the normal operating cycle of the institution;
- They are cash or equivalent complement not restricted in its use.ù

Prepayments and accrued income

The items include deferred expenses and accrued incomes whose competence is delayed or advanced with respect to cash or documentary.

Liabilities

“**Non-current**” liabilities are long-term financial obligations that are not due within the present accounting year.

“**Current**” liabilities are related to the operating cycle; liabilities have been considered as “current” when:

- They are extinct in the course of the normal operating cycle of the institution;
- The extinction is due within 12 months from the balance sheet date.

Accrued expenses and deferred incomes

This item includes the amount of funds received for the year 2019 and not yet fully used, following the accrual basic principle, by December 31st, 2019 for the purposes they were intended. They will therefore be used in coming years for the same purposes.

This item represents the carry-over for balances of subsequent years to that under review. In this regard, the Consortium is obliged to operate in future years in fulfilment of the mandate conferred by the General Assembly in compliance with the scope designated by Statutory monetary yearly contribution.

In-kind contributions

Contributions in kind have been acquired in the financial statements on the basis of the details contained in the document entitled "Methodology for Defining the Values Involved in the EMSO ERIC Activities, and to Detail the In-kind Contributions", when available, under the conditions specified therein. It is foreseen the consolidation of the above mentioned “Methodology” and the control of the 2019 data, to be referred to INGV and CSIC 2019 in-kind contributions attributed to EMSO, between the internal auditors (entrusted by INGV and CSIC) EMSO CFO and EMSO auditors.

Profit and loss account

The drawing-up of the profit and loss account is regulated by the IPSAS, integrated and conformed to be consistent with the characteristics and scopes of EMSO-ERIC.

Incomes

Incomes are increases of the benefits connected to the administrative year.

Costs/Expenses

Costs/expenses are decreases of the economic benefits of the administrative year. The analysis of costs has been explained in the overview of the profit and loss account using a classification based on their nature.

4. In-kind contributions

The Financial Statement includes “In-kind” (non-monetary) contributions from the Members evaluated on the basis of the cost of the production factors related (exhausting their utilities during the ordinary cycle).

The Financial Statement does not include “in-kind” contributions related to cover investments (in tangible and intangible assets).

As a EMSO-ERIC policy since 2016, the In-kind contributions are validated on the basis of the time sheet of the personnel allocated. The cost of personnel allocated by Members through the in-kind is not reported as cost for funded projects and therefore do not generate additional revenues for EMSO-ERIC.

5. General information

It is stated that 2019 represents the fourth financial year of EMSO.

6. Assets

(N.B. All figures are in Euro)

Non-current assets

Total non-current assets:

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
32.177	33.094	917

Intangible assets

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
1.073	808	(265)

The composition is as follows:

Description	Initial cost	Investment /disinvest.	Final cost	Amortization/ Depreciation	Amortization/ Depreciation fund	Residual value
Intangible Assets						
Software	3.218	-	3.218	1.073	3.218	-
Trademark	-	850	850	42	42	808
Total	3.218	850	4.068	1.115	3.260	808

Tangible assets

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
31.104	32.286	1.182

The composition is as follows:

Description	Initial cost	Investment /disinvest.	Final cost	Amortization/ Depreciation	Amortization/ Depreciation fund	Residual value
Tangible Assets						-
Office equipment	32.735	7.514	40.249	5.924	10.626	29.623
Mobile phones	5.079	1.332	6.411	1.740	3.748	2.663
Other minor tangible assets	2.516	295	2.811	295	2.811	-
Total	40.330	9.141	49.471	7.959	17.185	32.286

Current assets

Total current assets:

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
1.601.334	1.509.393	(91.941)

Long-term credits

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
12.060	11.843	(217)

The composition of the amount as at December 31st, 2019 as follows:

Description	After 12 months	Total
Deposit for real estate rent	11.700	11.700
Deposit for utilities	143	143
Total	11.843	11.843

“Deposit for real estate rent” refers to the caution deposit (security) paid for the DG’s accommodation.

Short-term credits

Total short-terms credits:

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
59.962	190.074	130.112

The composition of the amount as at December 31st, 2019 is as follows:

Description	Within 12 months	Total
Credits for members' statutory contribution in cash	-	-
Credits for other contribution in cash	189.962	189.962
- Credits to EU	156.862	156.862
- Credits to INGV	33.100	33.100
Other current credits and receivables	112	112
Total	190.074	190.074

All Members' statutory contribution in cash have been cashed. The contribution related to the entire year is equal to € 465,000 (of which € 220,000 from the Italian Hosting Country and € 245,000 from the other Members).

The item "Credits for contribution in cash" to EU represents the credit to cover the cost incurred in the realization of each EC projects in which EMSO is involved and it is divided as follows:

- EMSO-Link € 80,989
- Danubius-PP € 7,078
- ENVRI-PLUS € 68,795

The item "Credits for contribution in cash" to INGV represents the credit for *una tantum* contribution 2018 (payed in 2020).

Cash and cash equivalents

The balance represents cash at the bank (ordinary and additional dedicated account) and in hand and thus the existing cash at the end of the financial year. The balance represents the liquid assets and the existing cash at the end of the year. Cash is held at the Bank Crédit Agricole CARIPARMA. In addition to the ordinary account, a dedicated account was opened, at the same bank, for EMSO-Link EC project of which EMSO is coordinator.

Description	Balance as of 31/12/2018	Balance as of 31/12/2019	Difference
Bank deposits	1.525.248	1.303.515	(221.733)
Cash	129	704	575
Total	1.525.377	1.304.219	

Prepayments and accrued income

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
3.935	3.257	(678)

In general, the item measures expenses calculated on accrual basis irrespectively from cash or documentary. This amount mainly represents prepaid expenses related to costs for insurances and other minor services whose utility is postponed to the next year.

7. Equity and liabilities

(N.B. All figures are in Euro)

EQUITY

Capital and other permanent contributions from Members

No values are entered for in this item.

Reserves

No values are entered for in this item (with the exception of rounding).

Accumulated surplus

No values are entered for in this item.

Non-current liabilities

Total non-current liabilities:

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
3.044	12.084	9.040

Long-term financial debts and loans

No values are entered for in this item.

Other long-term debts and liabilities

No values are entered for in this item.

Employee's severance indemnity

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
3.044	12.084	9.040

This item represents the actual debt of EMSO-ERIC at December 31st, 2019, to employees in force at that date (n. 4 employees) and it is made up as follows:

Description	
Initial value	3.044
Severance accrued during the year	9.136
Severance paid during the year	-87
Tax	-9
End value	12.084

At December 31st, 2019 advances have not been required by employees.

Current liabilities accrued expenses and deferred income

Total current liabilities and accrued expenses and deferred income:

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
1.630.467	1.530.403	(100.064)

Short-term financial debts

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
954.881	369.910	(584.971)

This item includes the contribution quotas due to the Partners for their participation to EMSO-Link Project. EMSO-ERIC is acting as coordinator.

Advance payments for project externally funded

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
115.196	490.674	375.478

This item includes the residual prepayment (after reduction for the cost claimed for the period) received from EU for participation to the following projects:

- Eurofleets+ € 27,060
- ENVRI-FAIR € 433,009
- ERIC-Forum € 17,667
- EuroSea € 12,937

Other short-term debts and liabilities

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
91.179	125.556	34.377

Detailed as follows:

Description	31/12/2018	31/12/2019	Difference
Debts to suppliers	54.772	56.482	1.710
Debts to General Director	5.000	5.000	
Payables to employees	10.096	24.160	14.064
Payables to social security institutions	3.221	12.522	9.301
Withholding taxes	3.115	9.699	6.584
Tax payables	6.709	11.145	4.436
Other payables	8.266	6.548	(1.718)
TOTAL	91.179	125.556	

Debts are valued at their nominal value and the expiration of the same is as follows:

- "Debts to suppliers" includes liabilities for purchases of goods and services;
- "Payables to employees" includes the remuneration of the month of December for € 13,699 and deferred remuneration for € 10,461;
- "Payable to social security institutions" includes the amount of social security contributions relating to employees, accrued but not paid as at December 31st, 2019;
- "Withholding taxes" includes withheld taxes for employees and collaborators;
- "Tax payables" includes liabilities for taxes and, for the year 2019, represents IRAP (regional tax) and intra-UE VAT;
- "Other payables" includes remaining debts of different nature.

Accrued expenses and deferred income

These items are related to incomes and costs referring to the period calculated on an accrual basis.

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
469.211	544.263	75.052

Accrued expenses

No values are entered for in this item.

Deferred income

Deferred income stated the amount of members' contribution portion attributable to future financial years.

The item is detailed as follows:

Description	Amount 2018	Amount 2019
Deferred income to carry-over 2016	104.124	104.124
Deferred income to carry-over 2017	235.788	235.788
Deferred income to carry-over 2018	129.299	129.299
Deferred income to carry-over 2019		75.052
TOTAL	469.211	544.263

The annual monetary contribution by Members was fixed in the amount equal to € 465,000 while the resources deferred to following years as carry over are € 75,052.

The amount of carry-over for 2019 is composed as follows:

Description	Amount
Resources committed to cover depreciation quotes	33.094
Resources committed to ordinary activities	511.169
TOTAL	544.263

8. Income statement, Profit and loss account

Revenues

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
807.375	1.135.193	327.818

The composition of the "Revenues" at December 31st, 2019 is as follows:

	2018	2019
National and international grants and contribution	806.874	1.135.146
<i>Contribution in cash</i>		
Monetary contribution of EMSO ERIC Members (net carry-over)	335.701	389.948
<i>Una tantum</i> cash contribution RE	33.100	35.000
H2020 EMSO-LINK Project	214.377	234.284
H2020 DANUBIUS Project	16.255	22.972
H2020 ENVRI PLUS Project	25.392	43.403
H2020 ERIC FORUM Project		3.680
H2020 EUROFLEETS PLUS Project		45.198
H2020 ENVRI FAIR Project		148.380
H2020 EUROSEA Project		355
<i>Contribution in kind</i>		
contributions in kind by hosting country	97.793	127.670
contributions in kind by members	84.256	84.256
Other revenues	501	47
TOTAL REVENUES	807.375	1.135.193

National and international grants and contribution

Contributions items identify:

- the portion of the cash contribution for the financial year allocated by the Members for the Consortium's starting activities to cover the ordinary operating expenses. This amount is exposed net of the carry over (€ 465,000 - € 75,052);
- the 2019 *una tantum* cash contribution from Italian R.E. INGV (€ 35,000);
- the 2019 cash contribution related to projects externally funded (€ 498,319);
- The above indicated revenues with reference to the EC projects DANUBIUS-PP and ENVRI-PLUS - finished in 2019- are still in course of assessment by the EC at the date of the redaction of the present Report. The project EMSO-Link, coordinated by EMSO ERIC and thus requiring an audit certificate will be completed by August 31st, 2020. The financial Reports will be forwarded to the European Commission by October 31st, 2020.
- the 2019 in kind contribution for staff cost made available by R.E. INGV (€ 127,670)
- the 2019 in kind contribution for staff cost made available by CSIC (€ 84,256).

Other incomes

"Other incomes" refers to rounding and minor adjustments.

Other revenues

During the year, EMSO did not carry out commercial activities, so it did not achieve any other revenue.

Operating costs

It is stated that the Consortium, in the context of purchases realized and within the limits following the Statute, may use VAT exemptions granted on the basis of Article 143(1)(g) and Article 151(1)(b) of Council Directive 2006/112/EC, and in accordance with Articles 50 and 51 of Implementing Regulation (EU) No. 282/2011 of the Council.

When it was not possible to invoke the exemption, the cost of VAT is included in the cost to which it refers.

Total operating costs:

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
791.633	1.114.199	322.566

Costs for raw materials, supplies, consumables and goods

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
2.405	468	(1.937)

This item includes costs incurred for the supply of consumables and tangibles of small amount.

Costs for services

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
507.240	641.957	134.717

It has been decided to detail the item services, to facilitate fair presentation of the budget determined by the operating characteristics of the Consortium.

Description	31.12.2018	31.12.2019	Difference
General Director - secondment indemnity	60.000	60.000	-
General Director - accomodation	26.796	27.295	499
General Director - travel cost	37.592	40.808	3.216
Financial Officer	57.096	58.792	1.696
Support to financial officer		2.625	2.625
Project Coordinator	71.476	77.012	5.536
Project Management	10.092	5.000	(5.092)
Support to project manager	5.500		(5.500)
Innovation and external relations office	107.466	79.831	(27.635)
Executive Assistant	7.006		(7.006)
Data Protection officer	-	5.000	5.000
Support to strategic plan	7.524	14.000	6.476
Other professional services	-	113.048	113.048
Translations	375		(375)
Other services		137	137
Conference organization	28.873	23.651	(5.222)
Fee for conference and issues	1.876	3.515	1.639
Graphic drawings and texts	650	-	(650)
Real estate brokerage costs	2.640	-	(2.640)
Telephone and communication utilities	8.525	9.146	621
Other services for the premises	8.570	6.550	(2.020)
IT support	2.408	10.440	8.032
Publicity, procurement	191	4.646	4.455
Auditor fees	5.000	6.000	1.000
Fiscal and administrative consultancy and accounting services	11.228	18.368	7.140
Legal consultancy	-	3.050	3.050
Trademark registration support	-	936	936
Travel costs for employees and collaborators	33.161	47.353	14.192
Staff training	10.000	20.000	10.000
Insurance	774	2.006	1.232
Postage	520	1.033	513
Bank charges	1.466	1.596	130
Others	435	119	(316)
Total	507.240	641.957	

Staff costs

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
69.213	213.699	144.486

This item includes the cost of staff directly employed in EMSO ERIC.

At 31/12/2019 EMSO has n.4 people hired with the status of employee of which n.1 part-time.

Staff costs includes:

Description	31.12.2018	31.12.2019
Salaries	50.512	156.238
Social security charges	15.497	48.216
Severance indemnities	3.044	9.137
Other personnel costs	160	108
TOTAL	69.213	213.699

Costs of rents, concessions and royalties for trademarks

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
28.061	42.093	14.032

This item represents:

- for € 30,972 the fee for the rent of the office in Via Resti (included condominium expenses);
- for € 10,101 the cost for licences of the software;
- for € 1,020 other minor fees.

Other operating costs

Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
2.665	4.056	1.391

Other operating costs consist of costs for stationery, administrative costs and other minor costs.

Resources committed in-kind to EMSO from contributors in Euro

Description	Balance as at 31/12/2018	Balance as at 31/12/2019	Difference
In kind by R.E. INGV	97.793	127.670	29.877
In kind by Members	84.256	84.256	-
Total	182.049	211.926	29.877

In-kind contributions have been accounted on the basis of IPSAS n.23.

This accounting standard is focused on contributions from non-exchange transactions, which have the following characteristics:

- 1) are not-reciprocal transfers;
- 2) are transfers of non monetary nature to or from entities acting on the basis of a specific agreement;
- 3) are made or received on a voluntary basis and valorised following to cost to basis criteria;
- 4) in particular, for services contributed in kind, these are accounted even in the cost and in the revenues of the receiving entities, depending on the fact that it is possible and objective to give a proper valorisation to them.

The cost of € 127,670 represents the staff contributed in kind by the Hosting Country (R.E. INGV), for the secondment of the following collaborators:

Professional profile	In Kind contribution
Programme officer	26.073
Support to Programm Officer	10.514
Science Officer	33.900
Liason with Hosting Institution	16.950
Graphic Designer	9.142
System Engineer	21.122
Legal staff	9.969
	127.670

The cost of € 84,256 represents the staff contributed in kind by CSIC for the secondment of the DG.

Professional profile	In kind contribution
General Director	84.256
	84.256

Depreciation (of intangible and tangible assets)

Depreciation is calculated on the basis of the useful life of the asset and its use in production. For the first year of use, the percentages applied have been reduced by half.

Description		Depreciation
Intangible Assets		
Software	33,33%	1.073
Trademark	5,00%	42
Total intangible assets		1.115
Tangible Assets		
Office equipment - furniture	15,00%	3.108
Office equipment - pc and other electronic machines	20,00%	2.540
Office equipment - office devices	12,00%	276
Mobile phones	33,33%	1.740
Other minor tangible assets	100,00%	295
Total tangible assets		7.959
TOTAL		9.074

Financial income and expenses

Description	31.12.2018	31.12.2019	Difference
Bank interest income	114	202	88
Exchange rate losses	(166)	(10)	156
Exchange rate income	9	-	(9)
Total	(43)	192	

Financial income refers to bank interest income; financial expenses refers to exchange rate differences.

Income tax

current tax	31/12/2018	31/12/2019	Difference
IRAP	6.742	12.112	5.370
Total	6.742	12.112	

Events after the reporting date

Following IPSAS n.14, in this paragraph it is reported about the events that have been occurred between the reporting date (December 31st, 2019) and the date when these Financial Statements have been approved by the General Director and thus are authorized for issue.

The only event occurred has to be referred to the worldwide crisis caused by the COVID-19 pandemics has been dealt with in Point 1.1 of the present Report.

It is relevant to state that this event can be classified among the “non- adjusting events after the reporting date” and it does not influence in the assessing of the appropriate assumption of the ongoing concern of EMSO ERIC.

The only temporary consequence connected to the described event could be identified in some potential slight inefficiency in maintaining the connection of the groups of technicians and scientists most involved in the activities of the Entity.

There are no valid reasons to believe that the aforementioned event could have influence in the process of allocation of the Membership fees, or of the Italian hosting cash contribution, or of the contributions in-kind by the Italian Representing Entity and by the other International Organizations involved in EMSO ERIC activities.

It should be noted that in 2020 the submission and control procedures of the reports relating to the two European projects, named Danubius and EMSO-Link, may be completed according to the acknowledgement of the Financial Reports approvals from the European Commission.

In this regard, it should be noted that the Danubius project ended in December 2019, while EMSO-Link project will end on August 31st,2020.

As a result of the aforementioned procedures there are justified reasons for believing that additional funds deriving from the two projects are expected in 2020, as hereinafter represented:

- EMSO-Link € 84,957
- Danubius-PP € 12,264.

This information also meets the conditions set out in IPSAS accounting principle n.19 regarding the “contingent asset”.

In 2019 EMSO carried on only no commercial activities, but, since is subject to Italian fiscal legislation, it has to calculate and be accountable for IRAP tax.

About this tax, EMSO adopts the "remuneration system" (art.10 of Legislative Decree 446/1997); this system provides that the tax base is determined from the sums paid for salaries of the employees, for incomes assimilated and for remuneration paid for coordinated and continuous collaborations or for activities of self-employment not practiced professionally.

It should be added as relevant facts occurred during 2019 that EMSO ERIC also finalized the European Trade Mark registration for EMSO ERIC name , finalisation of the procedure for the data privacy protection the DPO appointment and the ISO 9001 certification process(approved in 2020).

3. ANNEXES

Annex I Data Portal and Tools

Data Portal provides a description of the different observatories, pointers to existing data and meta-data sources, and overview data visualizations. Some screenshots from of the data portal are shown below.

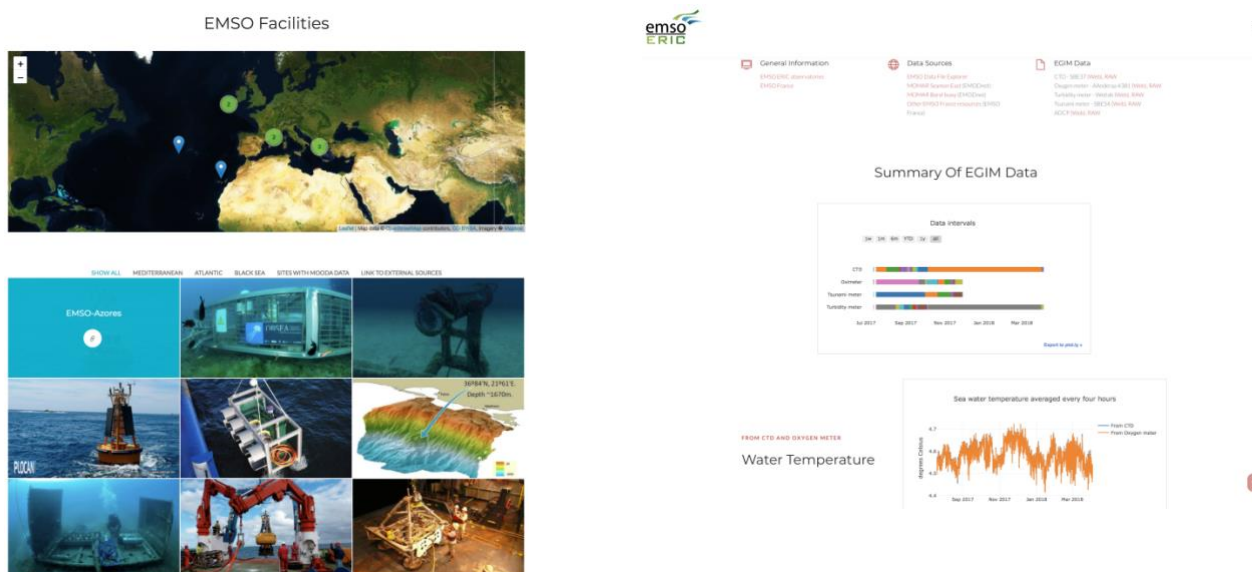


Figure A1 EMSO ERIC Data Portal

The File Explorer provides file-based access to harmonized data and metadata. Both binary (i.e., NetCDF) and text-based formats are available. The implementation is based on key attributes from the OceanSites specification; however, core and optional meta-data attributes are to be defined by a focused task group of the EMSO ERIC Data Management service group. An important capability of the File Explorer is that data from multiple sources are readily available in the same network, which allows implementing added-value services. For example, these data files are exposed to the analytics platform which allows fast and efficient data analytics. It also has the potential to facilitate the implementation of multi-node services such as the temperature/salinity multi-node service that is currently being developed with the science service group. An example of harmonized data in the File Explorer is shown as follows.



Date 2015-07
Temporal extent 1988-2018
Author(s) [Coppola Laurence](#)^{1,2}, [Diamond Riquier Emile](#)^{1,2}, [Carval Thierry](#)³
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3: Ifremer, Service Ingénierie des Systèmes d'Information, France
Source DOI [10.17882/43749](#)
Source [BEANDE](#)
Publisher [BEANDE](#)
Keyword(s) Ligurian Sea, marine biogeochemistry, sediment traps, dissolved oxygen, nutrients, carbon export
Abstract In the framework of the French MOOSE project (Mediterranean Ocean Observing System for the Environment), an extension time series (called DYFAMED) Ligurian Sea performs since 1991 a monthly multidisciplinary monitoring to observe: 1) the evolution of the water mass properties (SW and WMOW); 2) the carbon export changes and 3) the variability of the biological species relative to climate forcing (temperatures, acidification). In addition to monthly CTD profiles, a stand-alone mooring is located in the DYFAMED site with CTD and currents sensors (since 2008) and two sediment traps (Technique PPS) for collecting large particles and zooplankton every 35 days (48 samples per year).
License

Figure A2 EMSO ERIC File Explorer

The EMSO ERIC DMP API provides programmatic access to EMSO ERIC data (i.e., it can be used by users or third-party repositories via machine-to-machine interfaces). In addition to facilitating data discovery, access and download, it enables building tools including data portals (e.g., EMSO ERIC DataLab), dashboards for data visualization, data product generation, etc. This baseline is expected to evolve according to ENVRI-FAIR project requirements and discussions within the data service group.

The API is a RESTful web service tool to allow programmatic access to EMSO ERIC data within the DMP (e.g., the API can be used by users or third-party repositories via machine-to-machine interfaces). The API is built using the open source framework Swagger that helps to design, build, document and consume RESTful APIs. Swagger and its related tools are compliant with the Open API Initiative (OAI) and the Open API specification. The implementation provided a set of basic endpoints (or operations) and uses authentication only for a number of administrative operations.

The DataLab is built on top of the EMSO ERIC DMP API for visually exploring and visualizing EMSO ERIC data within the EMSO ERIC DMP. The current prototype is focused on key functionalities and it is expected to evolve leveraging expertise and synergies in the data service group. An overview of the prototype EMSO ERIC DataLab (left) and a sample plot generated online (right) are shown in the figures below.



Figure A3 EMSO ERIC DataLab

Other services built upon the EMSO ERIC DMP API include dashboards and environments for analytics such as a cloud-based platform based on Jupyter. The Jupyter platform has access to the EMSO ERIC data within the same network as described above and provides sample notebooks for using the EMSO ERIC data. The figure below shows sample notebooks delivering EMSO ERIC data visualizations.

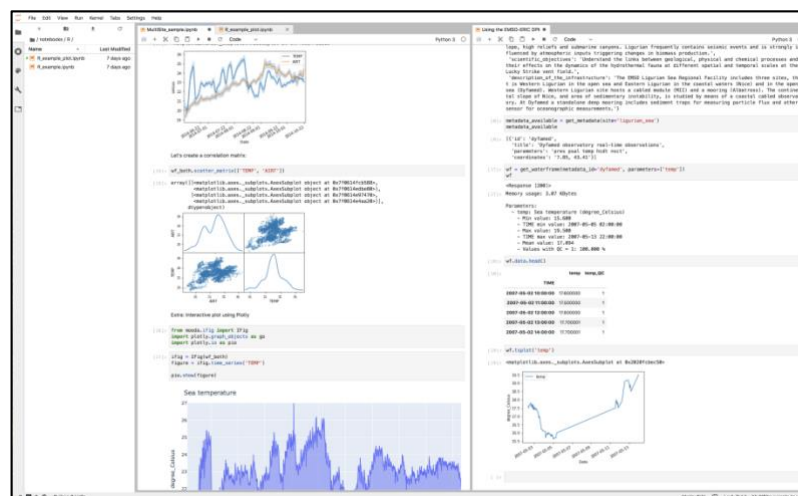


Figure A4 EMSO ERIC data visualizations

We deployed GitLab for software and systems configuration management which is available to the entire EMSO ERIC upon user registration. GitLab which provides a git-based repository manager providing wiki, issue-tracking and continuous integration pipeline features, using an open-source license.

Annex II Communication an outreach

The [NEWS & EVENTS](#) section is a useful channel to disseminate the activities carried out in the EMSO RFs, as well as the information about the upcoming outcomes and events of EMSO.

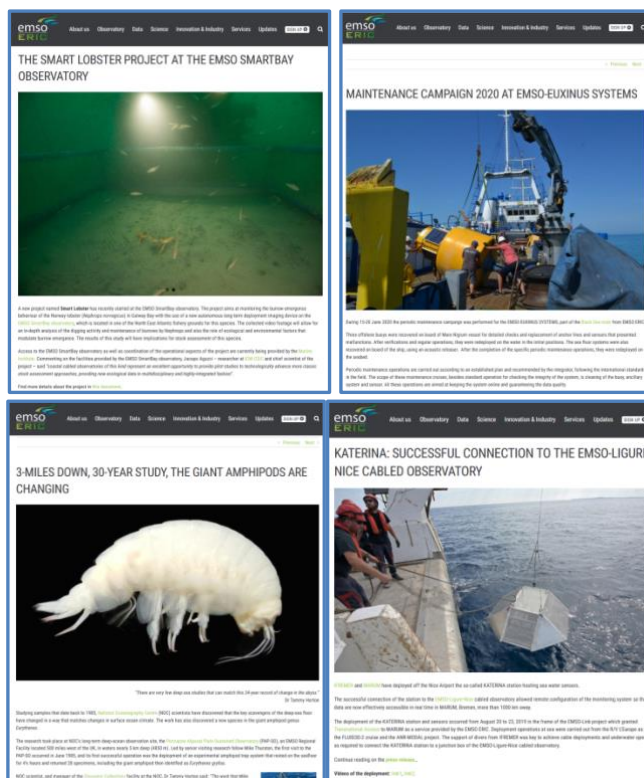


Figure A5 Some screenshots related to the latest news published coming from the EMSO RFs

❖ EMSO ERIC social media channels

The EMSO social media channels, Facebook, Twitter and LinkedIn were permanently updated to share information about EMSO ERIC.

Facebook

As now, **463 people** are following the page and this number has continuously grown since January 7th, 2017.

The posts have traced the different activities developed by EMSO ERIC from the participation in an event/conference to the great success of a publication and outcomes of the projects, up to advertise also about the subscription of a memorandum of understanding between EMSO ERIC and other Organizations.

Twitter

EMSO twitter account now counts **1177 followers** starting from 790 in March 2017. This channel has been used to share the activities, events of “sister infrastructures” to the EMSO community. All the Members have been invited to link the EMSO twitter account, as well as for the EMSO Facebook account; this gave them the chance to repost the EMSO twitter and link their own posts directly to EMSO helping in this way the consortium to increase its visibility.

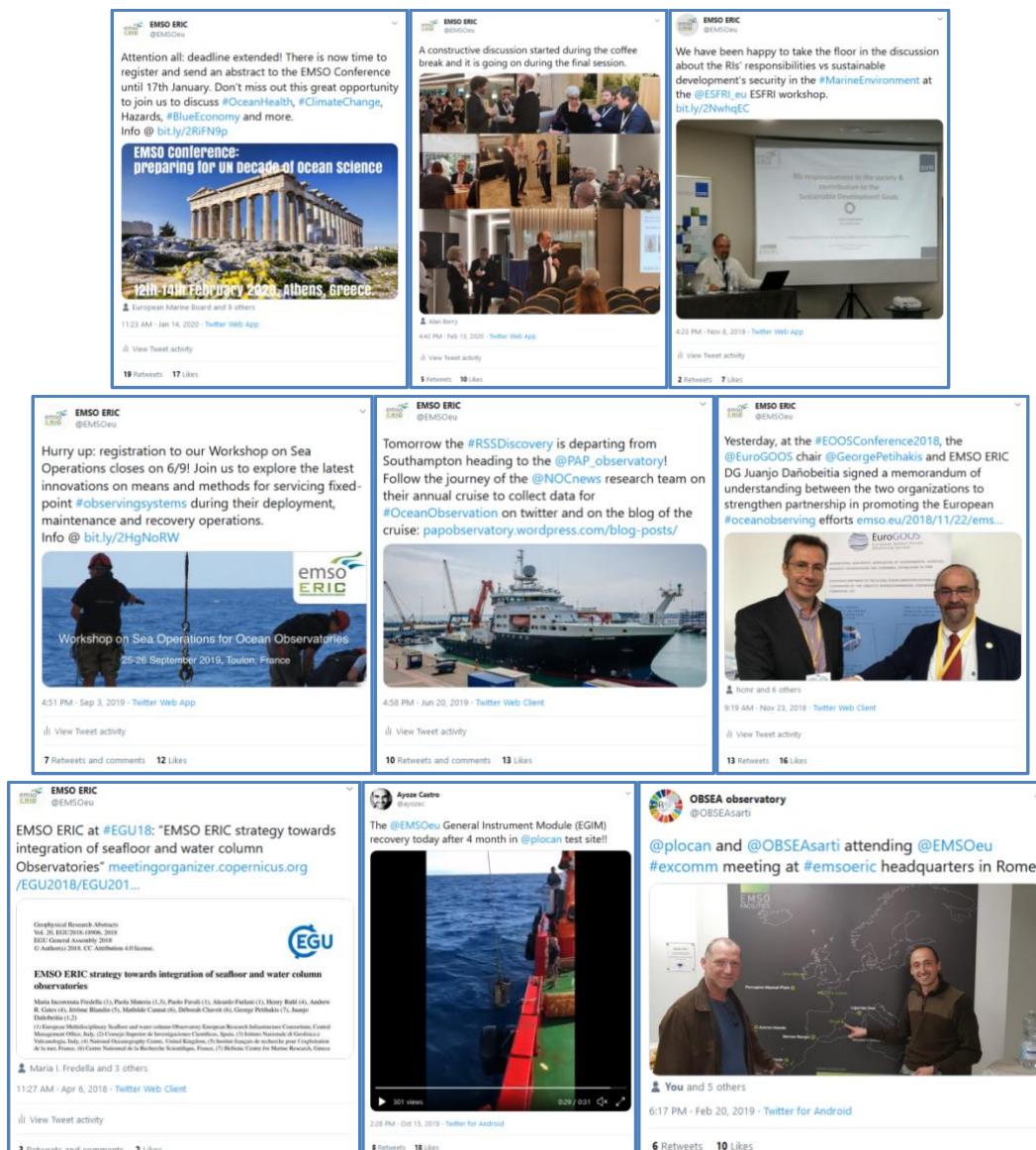


Figure A6 Some of the most popular twitters (with the higher users' engagement) collecting during the Project lifetime and examples of twitter shared by the partners

LinkedIn

EMSO LinkedIn account has now **256 followers**. Most of these followers work in the research field but there are also a lot of different workers as educators, media and communication experts, business developers.

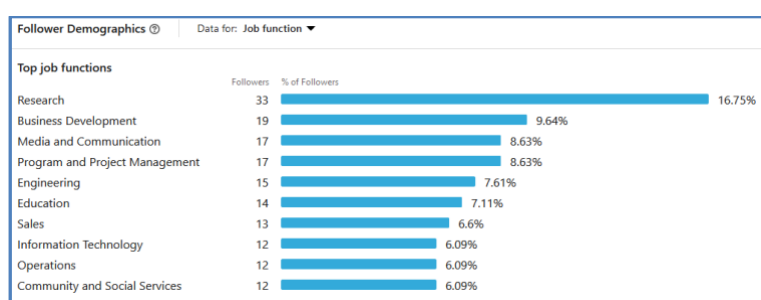


Table A1 Main classifications of the LinkedIn Followers' job

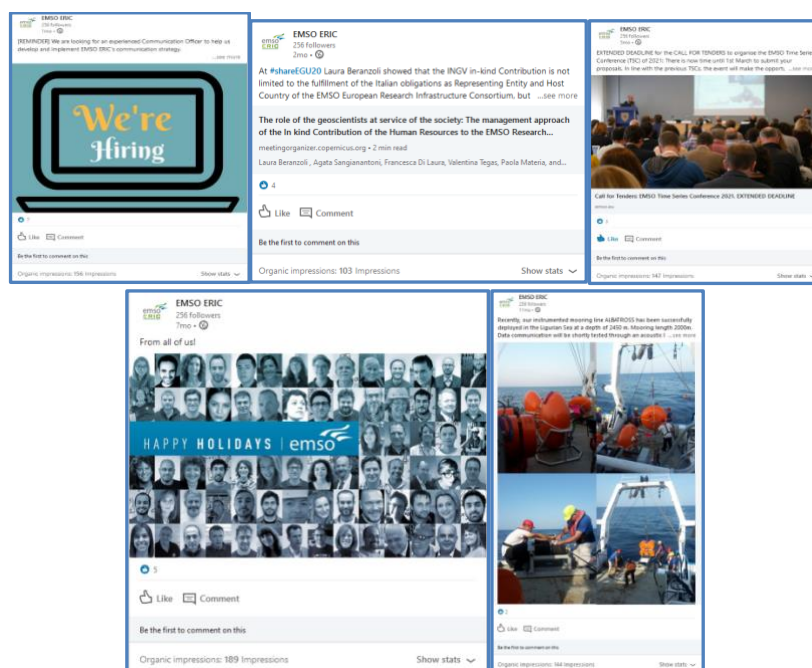


Figure 7 Some screenshots of the LinkedIn posts delivered

Public engagement

Two papers for a non-specialized audience have been developed. The first one has been published in the Italian magazine “Platinum | Il Sole 24 ore” on the issue of April 2019 is entitled “Research infrastructures for European development”. A printed copy of that issue has been distributed by the editor also during the ESA Living Planet Symposium held in Milan in May 2019. GeoEcoMar developed the second paper “GeoEcoMar and EMSO ERIC - Strategic Partnership in Marine Research for Advanced Monitoring of European Oceans and Seas”.

By taking advantage of the institutional tools provided by own institution, some partners published papers for their institutional blog to increase the national awareness on EMSO relevance to a not specialized audience:

- <https://papobservatory.wordpress.com/2019/07/06/long-term-ocean-observations-an-international-challenge/>
- <https://ingvambiente.com/2018/11/13/emso-una-rete-di-osservatori-nel-profondo-dei-mari-per-comprendere-eventi-estremi-e-cambiamenti-climatici/>

Some booths have been organized by partners for national events strongly reached the general public:

- *INGV Open Day - EMSO Western Ionian Sea Booth* (20/01/2019, Rome, Italy);
- *Seafest 2019 - Exhibition of the EMSO SmartBay observatory* (17/07/2019, Cork, Ireland);
- *Greek European Researcher's Night – EMSO stand* (27/09/2019, CretAquarium, Heraklion, Greece);
- *INGV Anniversary - EMSO Western Ionian Sea Booth* (29-30/09/2019, Rome, Italy).

Annex III Exhibitions, Conference, workshops, publications

❖ Exhibitions and Trade fairs

To ensure active promotion in the scientific community, in end-user sectors the EMSO exposure has been developed also through the organization of EMSO booths at international events and co-participating in ENVRI booths at some other relevant events.

Here below the list of developed activities:

- *EGU 2019 - ENVRI Booth* (7-12/04/2019, Vienna, Austria);
- *Oceans 2019 -EMSO ERIC Booth* (17-20/06/2019, Marseille, France);
- *ESA Living Planet Symposium - ENVRI booth* (13-17/05/2019, Milan, Italy);
- *OBSEA Presentation* (01/09/2019, Vilanova, Spain);
- *Galway Science and Technology Festival 2019* (10/11/2019, Atlantaquarium, Galway, Ireland).

❖ Conference Sessions

Here below the sessions organized and/or co-organized in 2019 during international conferences:

1. EMSO ERIC, assisted by CNRS, organized the session [OS4.8](#), “**Using and acquiring monitoring data to enhance the knowledge of key oceanic processes and their interactions**” at the EGU General Assembly 2019.
2. EMSO ERIC co-organized with ONC (Ocean Network Canada) the session [OS52A](#), “**Cooperative Research Strategies for Ocean Observatories Infrastructures to Support the United Nations Decade of Oceanic Science for Sustainable Development**” at the 2019 AGU Fall Meeting.

❖ Workshops and Trainings

Here below the list of the workshops organized in 2019:

- **Workshop on Sea Operations for Ocean Observatories**, IFREMER, 25-26/09/2019, Toulon, France.
- **EMSO Label Workshop**, IFREMER, 24-27/09/2019, Toulon, France.

❖ International conferences and workshops

EMSO ERIC has been very effective in submitting contributions to international events and here below they are listed:

- **EGU General Assembly 2019**, 7-12/04/2019, Vienna, Austria
 - Van Ganse et al., “Fixed Observatories and Long-time-Series of Dissolved Oxygen Measurements: Good Quality Data is a Challenge” (poster), OCEANS 2019 - Marseille, 17-20 June 2019, DOI: 10.1109/OCEANSE.2019.8867385
 - Fredella M.I. et al., “Enhancing the EMSO ERIC Regional Facilities by integrating and harmonizing EMSO strategies across facilities” (poster), 21st EGU General Assembly EGU2019, Proceedings from the conference held 7-12 April, 2019 in Vienna, Austria, id.17178
 - Coppola L. et al., “Last biogeochemical results from an integrated open-sea network in the north-western Mediterranean Sea”
 - Lanteri N. et al., “The EGIM, EMSO generic instrument module, step towards standardization”, OCEANS 2017 - Aberdeen, 19-22 June 2017, DOI: 10.1109/OCEANSE.2017.8084824

- **Oceans 2019, 17-20/06/2019, Marseille, France**
 - Lefevre D. et al., Fixed Observatories and Long-time-Series of Dissolved Oxygen Measurements: Good Quality Data is a Challenge, OCEANS 2019 c- Marseille, 17-20 June 2019, DOI: 10.1109/OCEANSE.2019.8867385
 - Bompais, X., et al., "EMSO-Ligure Nice, a Coastal Cabled Observatory Dedicated to the Study of Slope Stability" OCEANS 2019 - Marseille, 17-20 June 2019 , DOI: 10.1109/OCEANSE.2019.8867040
 - Gaughan, P. et al., "The dual roles of SmartBay, an advanced purpose built multi-disciplinary subsea observatory delivering sustainable long term coastal marine observations and marine technology development".
- **Giornate di studio sull'ambiente marino - 26-27/06/2019, Roma, Italy**
 - Sgroi T. "Velocity structures and kinematics in the Ionian Sea (Italy) from seismological data recorded by NEMO-SN1 seafloor observatory"
 - Decaro M. "Acoustic T-phases recorded by seafloor observatories at the Tyrrhenian and Ionian deep sites"
 - LoBue N. "The role of fixed multidisciplinary observatories in the exploration of ocean processes and the solid earth from the seafloor"
- **OceanObs'19 16-20/09/2019, Honolulu, Hawaii, USA**
 - Dañobeitia J.J. et al., Towards a comprehensive and integrated strategy of the European Marine Research Infrastructures for Ocean Observations"
- **AGU Fall Meeting 2019 9-13/12/2019, San Francisco, USA**
 - Bardaji R. et al., MOODA Water Frame: an abstraction for enriched data harmonization and transport from data ingestion to data analytics, American Geophysical Union, Fall Meeting 2019, abstract #OS53B-1530
 - Cannat M. et al., "Building multisite science services for the European Multidisciplinary Seafloor and water column Observatory (EMSO) Research Infrastructure" (poster), <https://agu.confex.com/agu/fm19/meetingapp.cgi/Paper/539697>
 - Dañobeitia J.J. et al., "EMSO, a Large-scale European Research Infrastructure Delivering Harmonized Environmental Marine Data through a Distributed Ocean Observation System" (poster) American Geophysical Union, Fall Meeting 2019, abstract #OS53B-1525
 - Fredella M.I. et al., "EMSO ERIC Growth Strategy to Increase the Value of Existing European Ocean Observatories Optimizing Interrelated Scientific Resources and Benefits." American Geophysical Union, Fall Meeting 2019, abstract #OS53B-1524
 - Ruhl H. "Evolving approaches for streamlining access to biology and ecosystem observations to support the objectives of the UN Decade of Ocean Science for Sustainable Development" American Geophysical Union, Fall Meeting 2019, abstract #OS52A-05.

❖ **Publications**

- Jones, D. O. B., A. R. Gates, V. A. I. Huvenne, A. B. Phillips, and B. J. Bett. 2019. *Autonomous marine environmental monitoring: Application in decommissioned oil fields*. Science of the Total Environment 668:835-853.

- Steinhoff T, Gkritzalis T, Lauvset SK, Jones S, Schuster U, Olsen A, Becker M, Bozzano R, Brunetti F, Cantoni C, Cardin V, Diverrès D, Fiedler B, Fransson A, Giani M, Hartman S, Hoppema M, Jeansson E, Johannessen T, Kitidis V, Körtzinger A, Landa C, Lefèvre N, Luchetta A, Naudts L, Nightingale PD, Omar AM, Pensieri S, Pfeil B, Castaño-Primo R, Rehder G, Rutgersson A, Sanders R, Schewe I, Siena G, Skjelvan I, Soltwedel T, van Heuven S and Watson A (2019) Constraining the Oceanic Uptake and Fluxes of Greenhouse Gases by Building an Ocean Network of Certified Stations: The Ocean Component of the Integrated Carbon Observation System, ICOS-Oceans. *Front. Mar. Sci.* 6:544. <https://doi.org/10.3389/fmars.2019.00544>
- Levin LA, Bett BJ, Gates AR, Heimbach P, Howe BM, Janssen F, McCurdy A, Ruhl HA, Snelgrove P, Stocks KI, Bailey D, Baumann-Pickering S, Beaverson C, Benfield MC, Booth DJ, Carreiro-Silva M, Colaço A, Eblé MC, Fowler AM, Gjerde KM, Jones DOB, Katsumata K, Kelley D, Le Bris N, Leonardi AP, Lejzerowicz F, Macreadie PI, McLean D, Meitz F, Morato T, Netburn A, Pawlowski J, Smith CR, Sun S, Uchida H, Vardaro MF, Venkatesan R and Weller RA (2019) Global Observing Needs in the Deep Ocean. *Front. Mar. Sci.* 6:241. <https://doi.org/10.3389/fmars.2019.00241>.

4. Appendix 1

EMSO ERIC Science Service catalogue, May 2019 version

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