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ERIC

EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM

ANNUAL  
REPORT  
2021

Observing the ocean to save the earth



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ERIC established by the European Commission  
Implementing Decision (EU) 2016/1757

# **EMSO ERIC** **ANNUAL REPORT 2021**

European Multidisciplinary Seafloor and water-column Observatory  
European Research Infrastructure Consortium (EMSO ERIC)

**Observing the Ocean to Save the Earth**



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# INTRODUCTION BY EMSO ERIC DIRECTOR GENERAL

Prof. Juan José Dañobeitia  
**EMSO ERIC Director General**



The year 2021 has been especially productive in advancing the operation of the EMSO ERIC services, despite the difficulties and restrictions imposed by COVID-19. With respect to Data and Data Products Services, access services to high-quality data, compliant with FAIR principles, EMSO has progressed according to a multimode approach<sup>1</sup> for the selection of environmental variables, with priority on temperature and salinity. In addition a high level of metadata harmonization has been achieved and specifically in the Marine Biology area, prioritization of ecologically-relevant EOVS (for example oxygen, pH) and FAIRification has been undertaken. A significant effort has been done in establishing a mechanism of interaction with the industry, which is crucial for any innovation initiative. Some

significant steps have been undertaken to understand the existing difficulties and barriers preventing a stable and long-lasting synergy between the industry and the RIs. EMSO ERIC has been one of the animators of relevant actions within the framework of the current European projects. Dissemination and training actions have been reinforced in 2021 compared to the previous years, in part thanks to the loosening of the pandemic restrictions. EMSO community has had a very active presence in international conferences, especially those connected to the actions within the UN Decade of Ocean Sciences for Sustainable Development framework, showing its commitment in constant progress. The EMSO Time Series conference 2021 focused on Marine Acoustics equipment and data analysis that took place in October in the Canary Islands, at the PLOCAN facility, with the participation of world-class speakers and trainers, recorded the presence of a high number of researchers and SMEs staff along, and has laid the foundations for the future EMSO Academy. I would like to conclude this brief introduction by mentioning the constant effort of EMSO ERIC to work on the integration and interoperability with other European and International Marine RIs and platforms and on the collaboration with international organizations with the medium-term objective of establishing a clear complementarity between all the players in the framework of a global ocean observation system.

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<sup>1</sup> <https://data.emso.eu>

## EMSO ERIC GENDER EQUALITY PLAN

According to the Horizon Europe regulations, organizations that are public bodies, research organisations or higher education institutions must have a Gender Equality Plan (GEP) in order to comply with the mandatory requirements related to all 2022 calls. This requirement will apply in the Grant Agreement preparation phase while during the submission phase a self-declaration will be required. The European Commission outlined specific elements (e.g., publicity, monitoring system, financial implications) to which each GEP must be compliant to ensure a step forward in the internal organizational process toward Gender Equality in Research.

EMSO ERIC started defining its Gender Equality Strategy already in 2017. At that time, it carried out the first gender study to assess differences in conditions, participation rates, decision making power and needs. The work was coordinated by the Central Management Office in the RI implementation project EMSO-Link. It was aimed at identifying gaps among the Research Institutions, beneficiaries of the project, and EMSO nodes representatives. This first step enabled the definition of the context, the main objectives and a set of principles at the basis of the EMSO strategy.

At the end of 2021, EMSO finalized its Gender Equality Strategy through the preparation of the official document “EMSO ERIC Gender Equality Plan (EE GEP)”<sup>2</sup>, which embeds a precise plan of actions to promote gender balance grouped in 5 main areas (Gender dimensions):

1. Gender balance in leadership and decision-making.
2. Gender equality in recruitment and career progression and promotion of the condition of access to personal development.
3. Work-life balance.
4. Integration of the gender dimension into EMSO ERIC organizational culture.
5. Gender-based violence including sexual harassment, sexist attitudes and perception of discrimination.

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<sup>2</sup> 10.5281/zenodo.6378755



In terms of financial commitment, EMSO ERIC decided to allocate economic resources to the implementation of the actions presented in the Plan.

The EE GEP was developed around the EIGE's gender mainstreaming cycle, the methodology proposed by the European Institute for Gender Equality. Following this approach, each phase corresponds to a step to implement the Plan. The EE GEP foresees the possibility to be updated on yearly basis, according to the EMSO ERIC overall strategy to ensure the most current practices in the gender equality issues align with the organisation's needs.

The document is made of:

1. A preparatory analysis of the political and legislative context.
2. An analysis phase to collect data, assess procedures, processes and practices and detect gaps in gender equality.
3. A planning phase. Based on the gap analysis, identify gender-related objectives, and set targets, actions and measures to achieve the goals. Moreover, resources and responsibilities are defined with an agreed timeline.
4. An implementing phase. Implementation of the activities.
5. A monitoring phase. Assessing processes and progress and adjusting actions, undertaking measures to optimize results.

EE GEP is based on specific data on the sex and gender of staff across roles and leadership within EMSO ERIC (EE) governance bodies, central management office, and research institutions operating for the EE activities.

EE GEP was signed by the Director-General and has been approved in the 17th EMSO ERIC Assembly of Members that took place on the 8th of March 2022, with the resolution n. #1/2022.

# EMSO ERIC

## Governance bodies and Organisation structure

### EMSO ERIC ASSEMBLY OF MEMBERS | 2021

The highest governing body in EMSO ERIC is the Assembly of Members (AoM), composed of EMSO ERIC members' representatives.

The AoM met remotely twice in 2021, in compliance with the legislation applicable to such cases to minimise the risks entailed by the ongoing Covid-19 medical crisis, on the 07/06/2021 (15th AoM) and 14/12/2021 (16th AoM) (in conformity with Statutes Art. 12, 20, 28).

Some changes in the official roles of the Assembly of Members occurred in 2021.

During the 15th AoM, the election of the EMSO ERIC Assembly of Members Vice-Chair was achieved, and Prof. Didier Marquer was elected in this role (resolution n. 2021/1, 21 April 2021).

In the same meeting, the Chair resigned his position but has made himself available for a smooth transition in order to have the new Chair in good time to organize the next AoM meeting.

Indeed, before the 16th AoM, Miguel Miranda was voted and elected through a written procedure as the new Chair of EMSO ERIC AoM (Resolution 12/2021, 2 August 2021).

During the 16<sup>th</sup> AoM, 14 December 2021, Ana Mafalda Carapuço was elected as the new secretary of the AoM.

MEMBER	DELEGATE	ADVISOR
FRANCE	<b>Didier Marquer</b>	<b>Delegate &amp; Vice-Chairman</b>
	Laurent Coppola	Advisor
	Nadine Lanter	Advisor
GREECE	<b>Vasilios Lykousis</b>	<b>Delegate</b>
	George Petihakis	Advisor
	Leonidas Perivoliotis	Advisor
IRELAND	<b>Mick Gillooly</b>	<b>Delegate</b>
	Alan Berry	Advisor
ITALY	<b>Cecilia Di Carlo</b>	<b>Delegate</b>
	Agata Sangianantoni	Advisor
	Laura Beranzoli	Advisor
PORTUGAL	<b>Miguel Miranda</b>	<b>Delegate</b>
	Mafalda Carapuço	Advisor
	Joana Pinheiro	Advisor
	Eduardo A. Pereira da Silva	Advisor
ROMANIA	<b>Viorel Vulturescu</b>	<b>Delegate</b>
	Vlad Radulescu	Advisor
SPAIN	<b>Jose J. Sanchez Serrano</b>	<b>Delegate</b>
	Eric Delory	Advisor
UNITED KINGDOM	<b>Matthew Dobson</b>	<b>Delegate</b>
	Richard S. Lampitt	Advisor
	Andrew Gates	Advisor
NORWAY	Pål Sørgaard	<b>Delegate</b>
	Benedicte Ferre	Advisor
	Ilker Fer	Advisor

Table 1 - Composition of the Assembly of Members

## EMSO ERIC ADVISORY COMMITTEE | 2021

The EMSO ERIC Advisory Committee (AC, formerly Science, Technology and Ethics Committee – STEAC) was launched and activated in 2020. The AC advises the AoM (Table 1) on all matters of a scientific, technical, and ethical nature or issues linked to EMSO ERIC's reputation and access to its data by research and operational users that may influence the scientific work carried out by EMSO ERIC. Moreover, the AC may propose actions to promote the use of EMSO Infrastructure by a larger community. The AC also participates in designing the EMSO ERIC biannual conference.

The Advisory Committee was successfully inaugurated in a zoom kick-off video conference meeting held on April 30, 2020. Despite the impersonal online format imposed by the Covid-19 lockdown, the event was the first and extraordinarily opportunity for the AC members to meet each other, as well as the Chair of the EMSO ERIC Assembly of Members (AoM), the Director-General of EMSO ERIC, and EMSO ERIC CMO. The "EMSO ERIC Advisory Committee (ex-STEAC)- Terms of Reference" was finalised in 2020, and the document complements the Implementing Rules n. 5 (Implementing Rules, First block October 2016 - as for the Statutes Art. 15). Scientists from various disciplines represent the Membership composition, together with Industry, technology and Innovation Hubs representatives, Research Infrastructure managers, and other experts whose background and specialisation can successfully contribute to the ERIC activities.

In 2021, the AC met three times to finalize the report "RECOMMENDATIONS ON EMSO BUSINESS PLAN". The report aimed at supporting the EMSO CMO in writing the sustainability plan included in the report "EMSO ERIC Long-term vision and strategic plan 2021-2023"<sup>3</sup>.

The extremely valuable contribution given by the AC during 2021 facilitated the consolidation of the EMSO vision and the sustainability of the operational plan to achieve the goals set out in the strategic plan for the years 2020-2023.

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<sup>3</sup> 10.5281/zenodo.5654745

NAME	SCIENTIFIC EXPERTISE	ORGANIZATION
<b>Alberto Basset</b>	Ecology	University of Salento LifeWatch ERIC Italy
<b>Pier Luigi Buttigieg</b>	Marine Microbial Ecology, Data Science	Alfred Wegener Institute for Polar and Marine Research Bremerhaven Germany
<b>Rick Donselaar</b>	Sedimentology	Delft University of Technology The Netherlands
<b>Carlos Duarte</b>	Marine Ecology	Red Sea Research Center South Arabia
<b>Peter Haugan</b>	Geophysical Oceanography	Institute of Marine Research Norway
<b>Shiuchi Kodaira</b>	Geophysics	Center for Earthquake and Tsunami JAMSTEC Japan
<b>Pierre-Yves Le Traon</b>	Physical Oceanography	IFREMER Mercator Ocean France
<b>Kim Juniper</b>	Microbial Ecology	Ocean Networks Canada ONC
<b>Monica Miguel Lago</b>	Oceanography	European Association of Remote Sensing Companies EARSC Belgium
<b>Nicolas Pade</b>	Marine Biology	European Marine Biological Resource Centre EMBR CERIC
<b>Montserrat Torne</b>	Geophysics	National Research Council CSIC Spain
<b>Filippos Vallianatos</b>	Geophysics, Seismology	University of Athens Greece
<b>Christine Valentin</b>	Business Management & Innovation	World Ocean Council WOC
<b>Vito Vitale</b>	Atmospheric physics, Polar	Italian National Research Council CNR Svalbard Integrated Earth Observing System SIOS
<b>Robert A. Weller</b>	Physical Oceanography	Woods Hole Oceanographic Institution WHOI USA

Table 2 - Composition of the Advisory Committee



## EMSO ERIC EXECUTIVE COMMITTEE | 2021

The Executive Committee (ExCom) is composed of the Director-General, the Regional Team leaders and the Service Group leaders. The Body features and functions are described in Art. 14 of EMSO ERIC Statutes and in Section 9 of the Implementing Rules, but it mainly ensures the implementation of the core mission of EMSO ERIC by coordinating activities of the Regional Teams and Service Groups.

A Regional Team (RT) is in charge of operating a Regional Facility and carries out the operational activities of EMSO ERIC. It comprises staff belonging to one or more scientific institutions, from one or more than one country. Each RT is represented by one representative, specifically by the Regional Team Leader (RTL), in the ExCom.

The ExCom met remotely five times in 2021 to minimise the risks entailed by the ongoing Covid-19 medical crisis.

The DG convened online meetings focusing on the EMSO central issues:

- definition of the EMSO ERIC Strategic Plan 2021-2023
- definition of the EMSO ERIC Work programme 2021-2022
- definition of the EMSO ERIC Gender Equality Plan
- services implementation status
- participation of EMSO ERIC in the first round of Horizon Europe calls for proposals
- update on institutional and administrative activities
- proposal for a new contribution model
- procedures for the ExCom renewal

NAME	EXCOM MEMBERS	ROLE AND AFFILIATION	
<b>Azores</b>	Pierre Marie Sarradin	Team Leader	CNRS
	Mathilde Cannat	Science Group Leader	IFREMER
	Jérôme Blandin	Service Group Leader	IFREMER
<b>Black Sea</b>	Vlad Radulescu	Team Leader	GEOECOMAR
<b>Canary Islands</b>	Eric Delory	Team Leader	PLOCAN
	Ayoze Castro	Service Group Leader	PLOCAN
<b>Hellenic Arc</b>	George Petihakis	Team Leader	HCMR
<b>Iberian Margin</b>	Zuzia Stroynowski	Team Leader	IPMA
<b>Ligurian Sea</b>	Laurent Coppola	Team Leader	CNRS
<b>Porcupine Abyssal Plain</b>	Susan Hartman	Team Leader	NOC
<b>Western Ionian Sea</b>	Davide Embriaco	Team Leader	INGV
	Alessandra Giuntini	Service Group Leader	INGV
<b>Molène</b>	Nadine Lanteri	Team Leader	IFREMER
<b>OBSEA</b>	Joaquin Del Rio	Team Leader	UPC
<b>SmartBay</b>	Alan Berry	Team Leader	Marine Institute
<b>Nordic Seas</b>	Ilker Fer	Team Leader	University of Bergen
<b>Western Mediterranean Sea</b>	Roberto Bozzano	Team Leader	CNR - IAS
<b>South Adriatic Sea</b>	Vanessa Cardin	Team Leader	OGS
<b>Cretan Sea</b>	George Petihakis	Team Leader	HCMR

**Table 3 - Composition of the Executive Committee**

# EMSO ERIC

## Director General and Central Management Office CMO

The Director-General (DG) is the Chief Executive Officer and legal representative of EMSO ERIC and is responsible for the preparation and implementation of the decisions and programs that are submitted for approval to the Assembly of Members (AoM). The DG, in the execution of the activities, is supported by the staff of the Central Management Office (CMO) and for its strategic implementation functions by the Executive Committee (ExCom). The CMO is in charge of supporting the Annual Work Program and the day-to-day administration and management of EMSO ERIC.

The Director-General pays particular care to the RI growth strategies. In terms of acquiring new members, he directly oversaw Norway's process in EMSO, supporting the Royal Norwegian Ministry of Climate and Environment in all official steps for inclusion since the beginning. On the 3rd of April 2020, the Royal Norwegian Ministry of Climate and Environment notified DG through a brief note of Norway's intention to apply to become a full member of EMSO ERIC. DG informed the Norwegian Ministry on the 8th of April about the procedures to follow according to EMSO ERIC statutes. Norway has officially been a Member of EMSO ERIC since January 2021.

A dedicated path to internal growth has been completed as an EMSO ERIC effort in supporting its staff' professional development. The learning and growth perspective is priority-oriented to support organizational change. Investing in employee skills is crucial to ensure the right people to the right places, especially for a Research Infrastructure.

## COORDINATION ACTIVITIES FOR SERVICES DEPLOYMENT AND OPERATION

The EMSO ERIC service functions, derived from the operational activities carried out by the Regional Teams that manage the Regional Facilities, are provided by the EMSO ERIC Service Groups, led by the Service Group Leader (SGL) and supported by the CMO Officers. CMO officers provide the integration and coordination of activities in EMSO ERIC to help the DG align the specific objectives and activities of the Service Groups with the objectives of the Strategic Plan.

Under the coordination of the DG, the CMO Officers, together with the Financial Officer, dedicated a significant effort to elaborating a Service Deployment Plan (SDP) for the full deployment of EMSO ERIC

services and operations during the 2020-22 period. The first draft of the document focused on Data management and was presented to the Assembly of Members on July 23rd 2020. The final version of the SDP has been approved by the AoM during the 16th meeting on December 14th, 2021.

The launch of a comprehensive set of EMSO core services, corresponding to and delivered by the EMSO Service Groups, has been planned within the SDP 2021-23, sizing the investment expenditure items and the overall cost to identify the financial sources that cover the increasing investment expenditures. Moreover, it includes a plan to improve CMO–ExCom coordination, efficiency and effectiveness with a CMO organigram chart centered on CMO Officers as first-line of support to Service Group Leaders in delivering EMSO services.

The first new service to be launched will be the EMSO Physical Access Program in April 2022.

## **SUPPORTING ACTIVITIES**

The Sustainability Strategy action supports the integration of the objectives set out in the Strategic Plan with the specific activities in the annual Work Programme. It is a transversal element to the entire RI and represents the collector of all aspects of RI's sustainability. The task is accountable to ensure that the agreed work programmes are synchronized with the strategy.

A specific "Governance Model" was designed in 2020 and it focuses on integrating the monitoring system within RI governance to facilitate the management of the activities and monitor the strategy execution risks identified in the plan. The EMSO ERIC quality management system has been built upon this methodology. The monitoring system interfaces with it, so the indicators (KPIs) and expected results include all planned expenditures.

## **MANAGEMENT OF H2020 PROJECTS**

The EU-funded projects in which EMSO ERIC has been involved in 2021 contributed to supporting the consortium in achieving valuable results for the implementation of the strategy, optimising RI's resources, and the carrying out of the activities planned in the EMSO ERIC Work Programme 2021. EMSO ERIC's participation in EU-funded projects for the year 2021 has been the following.

## HORIZON 2020 RUNNING PROJECTS

### ENVRI-FAIR (H2020-RI)

**TITLE:** ENVironmental Research Infrastructures building Fair services Accessible for society, Innovation and Research

**COORDINATOR:** FORSCHUNGSZENTRUM JULICH GMBH

**PERSON MONTHS:** 123,80

**START DATE:** 01/01/2019

**DURATION:** 48 months

**CONNECTION WITH EMSO STRATEGY ENVRI FAIR links EMSO :** ENVRI FAIR links EMSO to the environmental Research Infrastructures and European Open Science Cloud (EOSC). The project is supporting the implementation of EMSO Data Services and the activity of the Data Service Group.

**BENEFITS REALIZED** the EMSO participation in the ENVRI FAIR project was organized to optimize the resources to achieve EMSO strategic objectives. EMSO contributed to the Marine Subdomain FAIRNness Roadmap, the Implementation Plan and the Technical Specification for the implementation process. All these activities are directed to improve the FAIRNess of EMSO data and to facilitate the connection with EOSC. The design of an architecture for the data harmonization according to FAIR principles enabled the development of EMSO ERIC data services, impacting EMSO ERIC's capabilities and facilitating the adoption of FAIR principles. Software components and plug-ins for the EMSO ERIC harmonization subsystem, which is a critical component for adopting FAIR principles across EMSO ERIC facilities, were developed and policy harmonization across EMSO ERIC regional facilities to enable the integration of services with the EOSC was conducted.

### ERIC FORUM (H2020-RI)

**TITLE:** ERIC Forum Implementation project

**COORDINATOR:** BBMRI ERIC

**PERSON MONTHS:** 3,75

**START DATE:** 01/01/2019

**DURATION:** 36 months

**CONNECTION WITH EMSO STRATEGY** The ERIC FORUM Project facilitates EMSO in the connection with the other ERICs and brings together 20 established ERICs. The life of the project runs in parallel with and supports the development of the ERIC Forum, the permanent, informal organization that brings together all ERICs

**BENEFITS REALIZED** The ERIC Forum is a framework dedicated to the ERICs to share knowledge and challenges and support the ERICs to have a common voice and vision on joint problems. It also increased the visibility and better positioning of the Forum towards its European stakeholders.



## EUROFLEETS PLUS (H2020-RI)

**TITLE:** An alliance of European marine research infrastructure to meet the evolving needs of the research and industrial communities.

**COORDINATOR:** Marine Institute

**PERSON MONTHS:** 15,5

**START DATE:** 01/02/2019

**DURATION:** 48 months

**CONNECTION WITH EMSO STRATEGY** EUROFLEETS PLUS facilitates the dialogue with the European research vessel community, giving the opportunity to EMSO to have a privileged channel of communication to inform about the needs of the infrastructure. The project is supporting the development of the Engineering and Logistic services.

**BENEFITS REALIZED** The privileged dialogue with the EU vessel community is supporting EMSO ERIC in shaping the maintenance procedures of the Regional Facilities, with a close connection of the Engineering and Logistic Service Group with the EUROFLEETS PLUS community, providing the requirements regarding deployment, maintenance and equipment recovery. Further information is included in the Engineering and Logistic section of this report.

## ENRITIIC (H2020-RI)

**TITLE:** Network of research infrastructure Industrial Liaison and Contact Officers

**COORDINATOR:** ESS ERIC

**PERSON MONTHS:** 8,25

**START DATE:** 01/01/2020

**DURATION:** 36 months

**CONNECTION WITH EMSO STRATEGY** ENRIITC aims at establishing a European network of Industrial Liaison and Contact Officers (ILOs/ICOs) engaged with EU Research Infrastructures. The project is supporting the development.

**BENEFITS REALIZED** The Innovation and Industry Service Group optimized the work conducted in the project to map the current state of the EMSO nodes in regard to industry engagement and collaborations, as a basis to develop the added value services of EMSO ERIC.

## EuroSea (H2020-BG)

**TITLE:** Improving and Integrating European Ocean Observing and Forecasting Systems for Sustainable use of the Oceans

**COORDINATOR:** HELMHOLTZ ZENTRUM FÜR OZEANFORSCHUNG KIEL

**PERSON MONTHS:** 4

**START DATE:** 01/11/2019

**DURATION:** 50 months

**CONNECTION WITH EMSO STRATEGY** The EuroSea Project facilitates EMSO in the connection with E00S and G00S, as well as the development of Data services.

**BENEFITS REALIZED:** EMSO has a dedicated task in this project for the harmonization of the RI with the global Eulerian observatory network (OceanSITES) and to progress on the elaboration of the metadata catalogue for Eulerian observatories with JCOMMOPS.

### AtlantECO(H2020-BG)

**TITLE:** Atlantic ECOSystems assessment, forecasting & sustainability

**COORDINATOR:** STAZIONE ZOOLOGICA ANTON DOHRN

**PERSON MONTHS:**2

**START DATE:** 01/09/2020

**DURATION:** 48 months

**CONNECTION WITH EMSO STRATEGY** AtlantECO supports the development of the EMSO ERIC science service on the study of microbiomes and plastic.

**BENEFITS REALIZED** This activity will be developed in the course of 2021.

## HORIZON 2020 PROJECTS STARTED IN 2021

### MINKE (H2020-RI)

**TITLE:** Metrology for Integrated marine maNagement and Knowledge-transfer nEtwork

**COORDINATOR:** CSIC

**PERSON MONTHS:** 22,55

**START DATE:** 01/04/2021

**DURATION:** 48 months

**CONNECTION WITH EMSO STRATEGY** MINKE supports the development of Engineering and Logistic services, in particular on metrology.

### Doors (H2020-BG)

**TITLE:** Developing Optimal and Open Research Support for the Black Sea

**COORDINATOR:** GeoEcoMar

**PERSON MONTHS:** 13

**START DATE:** 01/06/2021

**DURATION:** 48 months

**CONNECTION WITH EMSO STRATEGY** Doors supports the collaboration of EMSO in the Black Sea region and with other ERICs (EMBRC, Lifewatch, Euro-Argo).

### EGI-ACE (H2020-RI)

**TITLE:** EGI Advanced Computing for EOSC

**COORDINATOR:** EGI

**PERSON MONTHS:** 15

**START DATE:** 01/01/2021

**DURATION:** 30 months

**CONNECTION WITH EMSO STRATEGY** EGI-ACE supports the development of Data services and the connection with EOSC.

# EMSO ERIC

## Administrative and Financial Management

EMSO ERIC is a not-for-profit legal entity/international organization undertaking mainly non-economic R&D activities, since 2016 showed a continuous growth of revenues essentially due to the increase of the number of EC-funded projects while the contributions from the Member States have been stable (See Table 4). It should be noted that starting as of January 1st 2022, EMSO ERIC Members Countries are nine as following as a consequence of the admission of Norway as a new Member State in 2021.

ACRONYM	EMSO-ERIC	BUDGET EMSO ERIC	REVENUES 2019	REVENUES 2020	REVENUES 2021	REVENUES 2022	BALANCE 2023-2025
<b>EMSO-Link</b>	EMSO-ERIC	539.926	234.284	171.721	-	-	-
<b>DANUBIUS-PP</b>	GeoEcoMar	47.187	22.972	11.091	-	-	-
<b>ENVRIplus</b>	ICOS ERIC	68.795	43.403	-	-	-	-
<b>ENVRI-FAIR</b>	FZJ	650.862	148.380	145.464	191.708	165.310	0
<b>ERIC Forum</b>	BBMRI ERIC	44.166	3.680	21.424	9.751	9.311	0
<b>Eurofleets+</b>	MI	129.000	45.198	35.778	20.131	23.000	4.893
<b>Eurosea</b>	GEOMAR	27.500	355	1.841	2.746	10.000	12.559
<b>ATLANTECO</b>	SZN	17.000	-	1.965	2.721	3.000	9.314
<b>ERIITC</b>	ESS	109.531	-	25.720	35.123	48.688	0
<b>Egi-ACE</b>	EGI Foundation	134.375	-	-		80.000	54.375
<b>MINKE</b>	CSIC	186.750	-	-	4.006	43.000	139.745
	GEOECOMAR						
<b>Total</b>		<b>2.095.092</b>	<b>498.272</b>	<b>415.004</b>	<b>269.887</b>	<b>420.000</b>	<b>319.492</b>

Table 4 - Evolution of ongoing funded EC Projects as of December 31st 2020

On the other hand, Table 4 effectively shows the overall trend in terms of the financial sustainability strategy followed by the ERIC. The working capital has been guaranteed by an adequate creation of reserves (cash carry-over) which allows EMSO ERIC to finance the growth without engaging the ERIC in undertaking debts and obligations towards third parties (Banks or other providers of finance).

The cash-flow reserve, decreased in 2021, will be kept to a steady level due to the reduced current operational expenses (mainly travel costs) in 2021 and to the reduced expenses generated by the limited mobility of the employees/consultants and their limited presence in the office due to COVID-19 pandemic. However, in the near future, it is foreseen the increase in the investment volume will absorb the cash reserves accumulated during the first phase of the EMSO ERIC development.

YEAR	CASH-CARRYOVER	REVENUES	YEARLY
	(in Euro)	(in Euro)	CASH-CARRYOVER REVENUES
<b>2016</b>	104.124	125.999	0,83
<b>2017</b>	235.788	496.954	0,47
<b>2018</b>	129.299	754.625	0,17
<b>2019</b>	75.052	998.319	0,08
<b>2020</b>	133.919	880.479	0,15
<b>2021 (est.)</b>	59.992	841.756	0,07
<b>Total</b>	<b>738.174</b>		

**Table 5 - Evolution of Revenues vs Cash carry-over over the years**

However, the cash carry over is being progressively reduced up to a level which will allow EMSO ERIC to face its current and medium-term obligations and carry out its R&D and service provision institutional activities. The break-down of the available resources in EMSO ERIC is shown in Table 6.



YEAR	TOTAL FTEs	FTEs Employees	FTEs Consultants	FTEs In-Kind Contributions
<b>2016</b>	<b>0,25</b>	0	0,25	0
<b>2017</b>	<b>4,95</b>	0	2,16	2,79
<b>2018</b>	<b>6,83</b>	1,8	2,19	2,84
<b>2019</b>	<b>8,63</b>	2,88	3	2,75
<b>2020</b>	<b>8</b>	2,3	2,45	3,25
<b>2021 (est.)</b>	<b>8,72</b>	3,2	1,85	3,67

Table 6 - Break-down of EMSO ERIC employees, consultants and in-kind contributions FTEs

EMSO ERIC has strongly relied on its Host Organization (INGV) which since 2016 provided significant financial support with respect to the other Member States but also on the availability of the In-Kind contributions which have been fully used by EMSO ERIC to guarantee the start-up phase. In addition, since 2017 the Spanish Institution CSIC started to provide a significant In-Kind contribution covering the salary cost of the Director-General (see Table 5) and other in-kind support. Other agreements are being signed to provide additional in-kind contributions by the European Regional Facilities participating in the ERIC (Service Level Agreements).

PROFILE	2020 (in €)	2020 (FTE)	2021 (Est. in €)	2021 (FTE)
<b>IN KIND</b>				
CSIC	92.396	1	92.000	1
INGV	191.609	2,67 (32 MM)	130.000	1,5 (18 MM)
UPC			25.000	0,83 (10 MM)
	<b>284.005</b>	<b>3,67</b>	<b>247.000</b>	<b>3,33</b>
<b>PERSONNEL</b>	<b>456.640</b>	<b>5,05</b>	<b>645.500</b>	<b>7,76</b>
<b>TOTAL</b>	<b>740.645</b>	<b>8,72</b>	<b>892.500</b>	<b>11,09</b>

Table 7 - In-Kind contributions provided by INGV, CSIC and UPC

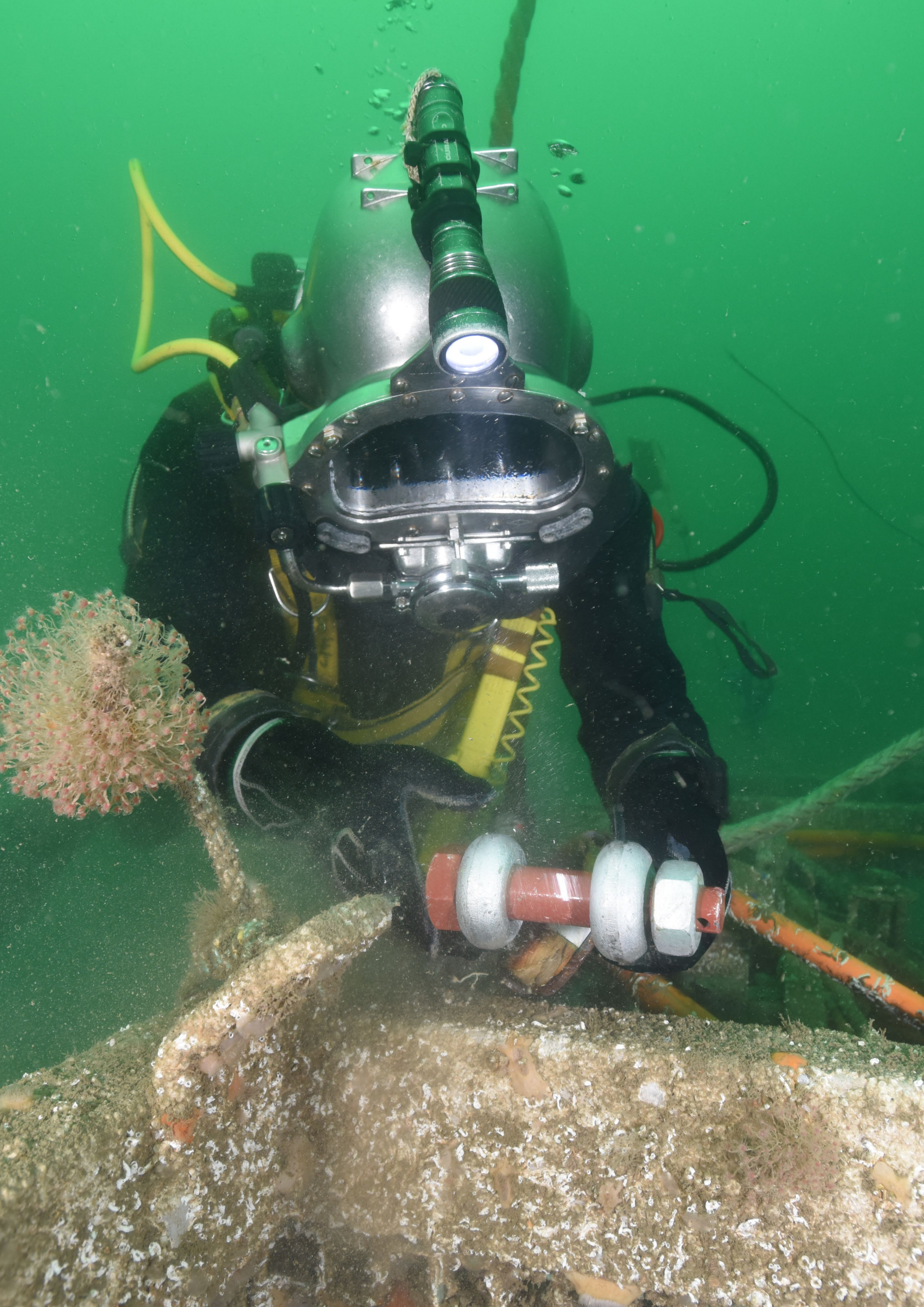
## COVID-19 PANDEMIC EFFECTS

At the moment of the redaction of the present Report, EMSO ERIC is implementing all the necessary measures to foresee a short-term impact on its operations and financial positions as a result of the COVID-19 pandemic.

Measures for protecting workers from exposure to and infection with SARS-CoV-2, the virus that causes Coronavirus Disease 2019 (COVID-19), depend on exposure risk. That risk varies based on the type of work being performed, the potential for interaction (prolonged or otherwise) with people, and contamination of the work environment. EMSO ERIC adopted infection prevention and control strategies based on a thorough workplace hazard assessment, using appropriate combinations of engineering and administrative controls, safe work practices, and personal protective masks to prevent worker exposures. Some measures applied to preventing occupational exposure to SARS-CoV-2 also required EMSO ERIC to train workers on elements of infection prevention and control, including social distancing and the use of protective masks. EMSO ERIC has assessed assumptions and included the related details regarding such assumptions in the Financial Statements projections. Nevertheless, EMSO ERIC must assume that future uncertainty will need to be assessed for any future effects. Among possible assumptions to be assessed, there is the impact of new possible shutdowns or quarantines, the implication of recently issued Italian and European laws, and the status of companies within the EMSO ERIC supply chain.

Given the rapid changes, EMSO ERIC will need to be monitoring the going concern assessment, conclusion and disclosures closely up to the point of issuance. In light of the ongoing 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 those of our service providers, (ii) continuity of essential internal operations, and (iii) limitation of financial impacts and protection of financial liquidity.







# EMSO ERIC

## Regional Facilities | 2021

EMSO consists of a spatially broad set of Regional Facilities (RFs) from the North Atlantic across the Mediterranean to the Black Sea, with water depths down to 4850 m. The fixed-point multi-sensor platforms are deployed in strategic environmental sites across the European seas. 2021 saw the growth of EMSO ERIC, both, in terms of Member Countries, with the inclusion of Norway, and observatories.

Three facilities have been approved by the Executive Committee to be incorporated in EMSO:

- **East Med - Cretan Sea E1-M3A - HCMR, Greece**
- **W Med - Western Mediterranean Sea W1-M3A - CNR/IAS, Italy**
- **Central Med - South Adriatic Sea E2-M3A - OGS, Italy**

Looking at the actual configuration of EMSO RFs, in the Atlantic, there are three open-ocean facilities (Azores, Porcupine Abyssal Plain, Iberian and Canaries) and two shallow-water testbed sites (SMART-Bay and Molène). In the Mediterranean, there are six facilities (Ligurian Sea, Western Mediterranean Sea, South Adriatic Sea, Cretan Sea, Western Ionian Sea and Hellenic Arc), each of which has multiple sites and one shallow water testbed facility at OBSEA, and the EuxRo buoys which is monitoring the Black Sea.

Moreover, the Northern Atlantic has always represented a tremendous player in our climate system and global ocean circulation. This large gap in the EMSO coverage has been filled in 2021 by the new Norway consortium, named Nordic Seas, aimed to create a comprehensive observatory network of the Northern Atlantic at the gate of the Arctic Ocean.

Nordic Seas includes several of the country's major universities and research institutes, with extensive Marine research and technology experience. It will bring an excellent fleet of ocean gliders, connecting fixed point observatories with water column observations. Norway's relationship with the seafloor and water-column observatories date back to the establishment of the European Seas Observatory Network (ESONET), a Network of Excellence supported by the European Commission after the EMSO Preparatory Phase.

Finally, Norway is on board, supported by the Research Council of Norway and the Norwegian Ministry of Climate and Environment, with a consortium led by Ilker Fer (University of Bergen) and Bénédicte Ferré (University of Tromsø).

RFs of the EMSO distributed infrastructure currently offer 58 scientific services: 10 access services and 48 data-based services. Of these fifteen facilities, six are cabled and therefore capable of delivering real-time data, and four are equipped with buoys with near real-time satellite communication capability. A list of Services in science areas is listed in Figure 2.

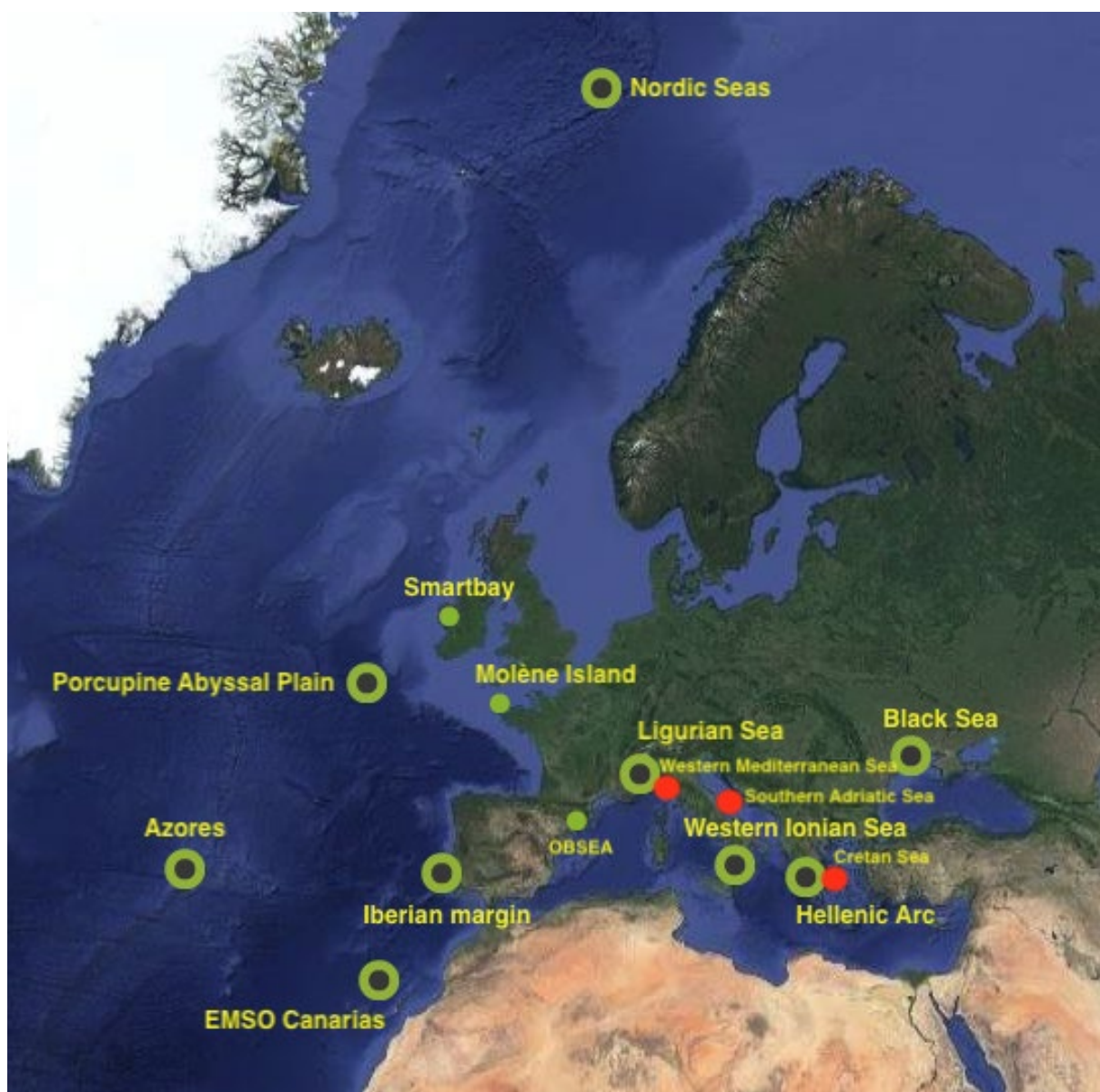


Figure 1 - EMSO regional facilities map



The meteorological and water column physics and biogeochemistry services are offered at nearly all facilities. Marine ecology and biodiversity services are currently mostly offered at the Atlantic facilities, while geohazards and geodynamics services are mostly developed in the Mediterranean region. Several key environmental indicators are measured at each facility.

TAs identified in the 2020 EMSO Science Service catalogue (see below), science services are delivered by individual RF. RFs were designed before creating the ERIC, they are operated independently, although EMSO ERIC activities are adding value to them through inter-facility standardization and the coordination of science, data management and logistics. Moreover, these services have clear potential as components of multi-nodes ERIC-scale services.

A detailed description of the Regional facilities provided by Member countries is included in ANNEX-2.

SCIENCE AREAS	SCIENCE SERVICE CATEGORIES
ATMOSPHERE & OCEAN	METEOROLOGICAL PARAMETERS
	WATER COLUMN PHYSICS AND BIOGEOCHEMISTRY
BIOSPHERE	MARINE ECOLOGY AND BIODIVERSITY
GEOSPHERE	GEOHAZARDS AND GEODYNAMICS
ACROSS SCIENCE AREAS	ENVIRONMENTAL INDICATORS (MSFD)

Figure 2 - EMSO data-related science services categories and SSG thematic leaders

# EMSO ERIC

## Mission implementation

EMSO ERIC Service Groups (SGs) provide the service function, data and other resources generated by EMSO Regional Facilities (RFs). These units ensure excellence in research and lead and promote innovation. They are participated by the staff of the Regional Facilities and are in charge of specific activities guaranteeing access to data, technology, and experience in innovation and scientific research.

Naturally, the guidelines from Central Management Office reflect this approach, which is structured around specific strategic elements, and decisions are made based on the established priorities. Accordingly, the EMSO ERIC Work Programme has been built around specific objectives and defines the activities that allow achieving the goals set at the strategic level identifying the personnel responsible for the execution of them. Regarding the objectives, they are formulated for a multi-year period and established in terms of assigned priorities, time horizon and available resources.

The objectives (relating to the year) arise from the strategic ones resulting from conciliation between strategic needs and practical conditioning constraints. They are articulated in sub-objectives, achievable and measurable through an internal evaluation process performed at the level of the CMO and each Service Groups.

At the end of the EMSO ERIC implementation phase, the year 2020 marked the execution of the commitment in the negotiation of an agreement between EMSO ERIC and the RFs owners (i.e., Service Level Agreement, SLA). The agreed and signed SLAs cover both the services provided to EMSO ERIC in the period 2020-2021 and set the estimated annual cost and commitment to EMSO ERIC in 2020. This is an essential milestone achieved in the planning of distributed activities in the ongoing RFs and allows EMSO to get data acquired by the RFs and their access (physical and virtual). Moreover, the SLAs agreements represented a turning point in the Consortium life cycle, impacting its sustainability and promoting greater transparency in the contribution of the member countries for the coming years.

A communication from the DG has been already sent to all the SLAs contact points asking them to update the tables attached to the Agreement:

- Schedule 1 "Services provided to EMSO ERIC" (data and access services) 2022/2023
- Schedule 2 "Annual estimated cost and effort provided to EMSO ERIC" 2022/2023.

The sending of the new forms by the Facilities has not been completed yet.



# EMSO ERIC Science

Excellence Science is the main driver for EMSO ERIC and the most urgent scientific questions and topics identified by the EMSO scientific community are the compasses that orient the efforts and the actions undertaken with the final goal of supporting new knowledge development and laying the groundwork for the expansion of the service portfolio.

EMSO reference community converged around the following scientific objectives recognised as urgent:

- Understand the distribution and behaviour of different invasive species in the European Seas, especially in the Mediterranean,
- Determine the structure and function of the microbiome in the context of ocean circulation and the presence of pollutants,
- Understand ecosystem characteristics in sites (e.g., the Black Sea),
- Understand the interaction between geosphere and hydrosphere in the context of the marine geo- hazards,
- Investigate the ocean noise on a broader frequency range to discriminate the sources and assess the impact of anthropic noise on marine life.

To pursue these objectives, EMSO ERIC has created the necessary conditions and promoted appropriate actions such as:

1. Streamline and integrate the existing competencies and capacities and
2. Provide its community with the necessary resources.

EMSO ERIC organised the competencies and capacities within and across the Service Groups (SGs) to pursue the abovementioned as follows:

- The Science SG and the Data Management SG jointly work to implement the recommendations and indications for data and metadata standardization and to develop the most valuable tools devoted to data visualisation and basic processing by the users,
- The Science and the Engineering and Logistics SGs integrate their respective competencies to develop new pieces of equipment and methodologies for generating new observations, while the Data Management develops the new data integration in the existing data portal.

EMSO ERIC also favours and supports networking with other RIs of the environmental sector, especially in the marine domain, to ensure and monitor metadata compliance with international standards and best practices.

The scouting of funding opportunities undertaken by EMSO ERIC has led to submitting a set of project proposals in response to Horizon Europe calls, some of which have been notified as successful. The projects complement the resources of the RIs and underpin their commitments to achieving the expected scientific results.



# EMSO ERIC

## Data Management and Information Technologies

### PROGRESS IN ENHANCING THE HARMONISATION AND FAIRNESS OF EMSO ERIC DATA AND INTEROPERABILITY

EMSO multidisciplinary and spatially distributed measurements/time series is the core on which the data management infrastructure is built on, with the explicit goal of delivering original continental-scale service products. The interoperability, harmonisation, and FAIRness of the Regional Facilities' (RFs) data are essential to providing access to multidisciplinary data and unprecedented data products. It is so clear as the challenges in achieving the full operation go through complete compliance with FAIR principles for data and services.

In 2021, EMSO ERIC made significant progress in the (meta)data harmonization, including the implementation of software components, the agreed metadata specification for EMSO ERIC based on OceanSites, NVS vocabularies and other standards, and a harmonized catalogue of (meta)data, instruments, and additional relevant information. Furthermore, EMSO ERIC has improved the machine-to-machine API and ERDDAP federation, has developed tools for process automation and capabilities for authentication and authorization and persistent identifiers, and has integrated data services into European Open Science Cloud (EOSC).

Improve interoperability, such as more mature standardisation, better semantics, and standard metadata, have represented the primary objectives of the yearly Data action plan, integrated within the EMSO Work Programme 2020. The RI is expected to be fully compliant with FAIR principles by the end of 2022. Results have been obtained to increase the interoperability with other RIs. The ENVRI-FAIR project framework represents a valid instrument for this purpose. EMSO also worked together with Euro-Argo ERIC and the marine component of ICOS ERIC and LifeWatch ERIC, and SeaDataNet as a European marine data management infrastructure to improve FAIRness. This enhances the RI's predisposition to connect its data repositories and services to the European Open Science Cloud (EOSC).

EMSO ERIC has continued working on increasing the interoperability of geophysical data/metadata of EMSO ERIC and EPOS ERIC, focusing on enriching the metadata of data and sensors. The full involvement of the EMSO community has been essential in the "Implementation of FAIR roadmap for Marine Solid Earth data" outlined within the framework of ENVRI-FAIR Project. As part of ENVRI-FAIR, an architecture to support the implementation of cross-subdomain data and metadata APIs has been defined as well.

## EMSO ERIC DATA SERVICES

EMSO ERIC data services leverage and complement existing networks (e.g., EMODNet, Copernicus, OceanSites) and data publishers. They fully exploit each Regional Facility's designated data sources (e.g., National data centers, tools such as ERDDAP, THREDDS, and automated APIs). Devoted task groups within the Data Service Group (DSG) focused their 2021 activities on deploying software tools with data discovery capabilities widely used in the marine domain. (e.g., ERDDAP). The deployed architecture is based on robustness and fault tolerance, including redundancy and failover capabilities on computing and storage resources, as well as scalability, and security, including a distributed architecture for data access and analysis. Furthermore, solutions for efficient movement of large datasets bring added value to the deployment of the data management platform. The already operational system provides open-access, accurate, long-term measurements of ocean parameters. It, in turn, has led to increased interoperability of EMSO nodes and the consistent collection of ocean essential variables data. The EMSO ERIC data management platform components enabled building tools, including data portals, dashboards for data visualisation, product generation, and the integration with other tools such as ERDDAP, facilitating data discovery, access, and download. RFs are evolving to cloud-based environments where data do not need to be moved out from a repository for their use and analysis. EMSO ERIC is facing these challenges by delivering a Virtual Research Environment (VRE) based on Jupyter, building upon the data management platform. Although the data services have been operated in pre-production, they already impacted the community in different ways, providing the community with access to added-value services. Key results include the deployment and operation of the data services in pre-production, including data portal (<https://data.emso.eu>), federated ERDDAP (<http://erddap.emso.eu>), API (<http://api.emso.eu>) and Jupyter-based Virtual Research Environment (<https://jupyter.emso.eu>).

Open-access data and its integration with EOSC impact researchers, educators, policy-makers, and the general public from European communities and beyond. During the course of 2021, the quality of service has been very close to 100% uptime without any significant incident. During that time, only the EMSO ERIC data portal received 4,625 portal visits and 38,058 requests from 1,883 distinct users from 115 countries. The countries with a larger number of visits include China, Italy, Spain, France, United States, United Kingdom, Portugal, Greece, and Japan, as summarized in the following Table 8 and shown in the statistics below, and in the distribution access per country (Figure 3).

Metric	2020	2021	Var (20-21)
Number of countries reached	85	115	+35%
Number of distinct users	1,010	1,883	+86%
Data portal page views	4,038	4,625	+14%
API requests	2,638	38,058	+1.442%
ERDDAP requests	1,367	24,722	+1.808%

Table 8 - Statistics related to the access to the data portal

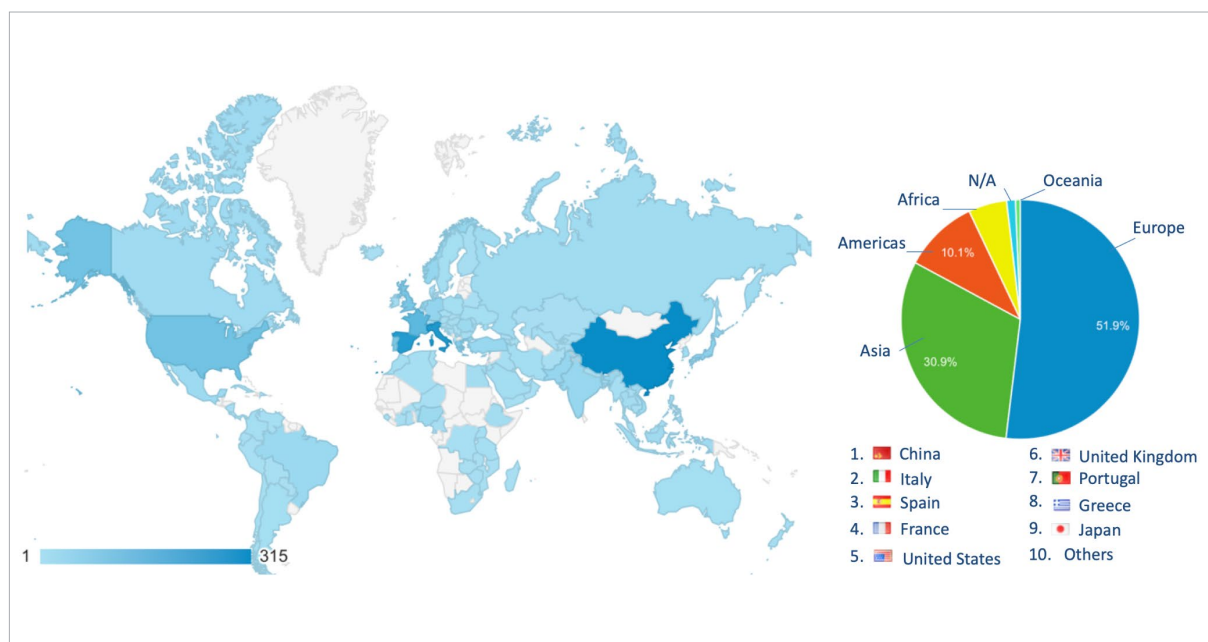


Figure 3 - Distribution of accesses per country and continent





# EMSO ERIC

## Engineering and Logistic

### ENGINEERING, STANDARDS AND INTEROPERABILITY IMPLEMENTATION

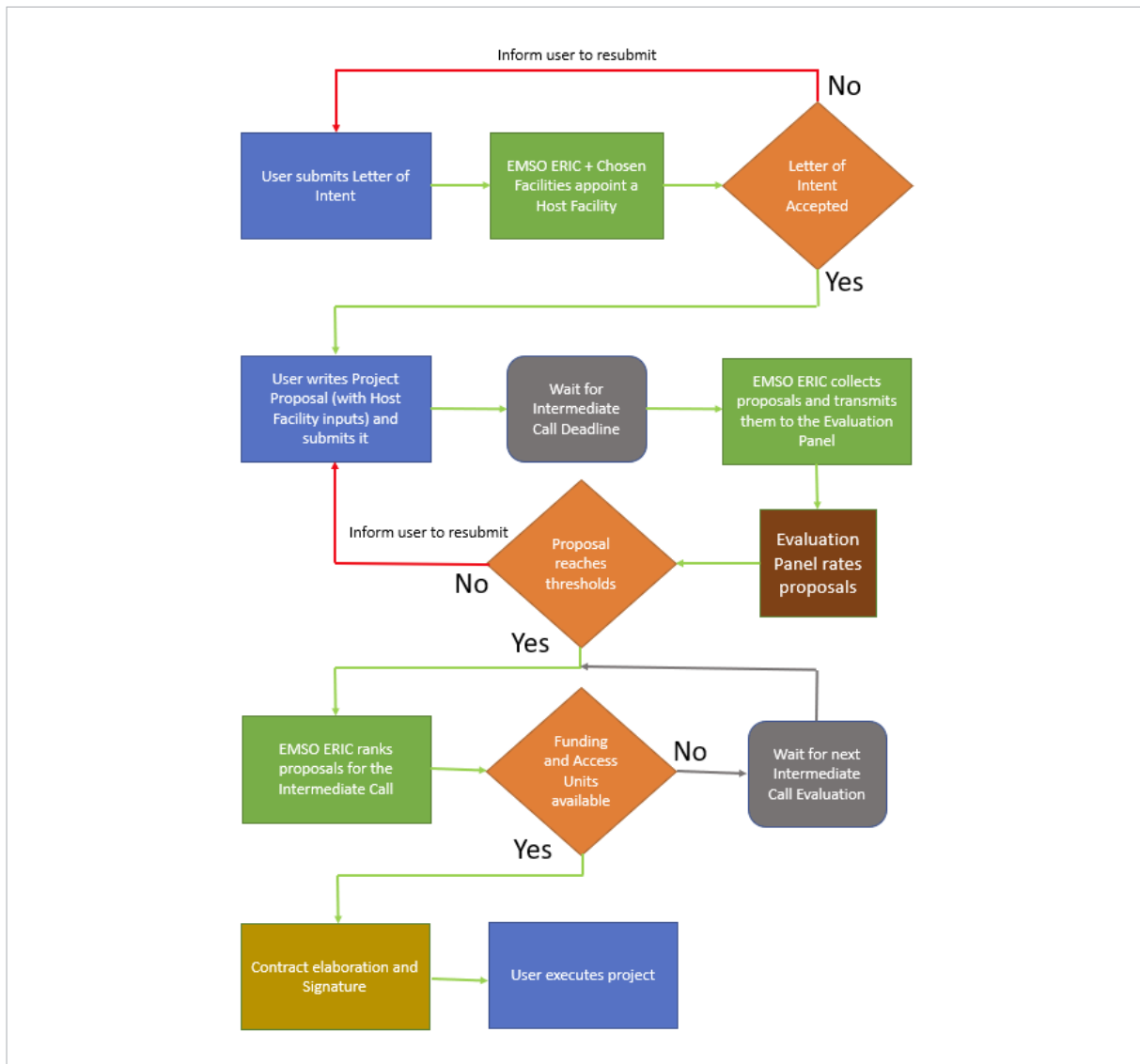
During 2021 regular meetings were held with the ELSG members in order to set the basis for the EMSO label implementation. The ELSG contribution to the label will be in the shape of a best practices handbook for operations and maintenance of the sensors and platforms. To this end, advancements were made in defining the access to the dissolved oxygen calibration bench, owned by IFREMER. Aside from that, the facilities equipment pool was created in an effort to set up a future system to share specific parts of equipment that can be bottlenecks for instrumentation deployment and operation.

### PHYSICAL ACCESS

The first call for Physical Access to the Regional Facilities that will take place in 2022 has been under preparation during 2021 (see workflow Figure 5), building upon the valuable TNA experiences and feedback from the EMSO Link project. Regional Facilities and Users mostly underlined that some economical support for travel and consumables would be very helpful to set up and run the projects. EMSO allocated 45.000 € to this end for the 2022 pilot call in which 4 Regional Facilities will participate. The new access system design also takes into account the fact that tight deadlines discouraged users to apply for access. The EMSO ERIC physical access system will be permanent year-round and every 2 months (see Figure 4) there will be a cut-off date in which the received proposals will be evaluated. This way, access will be offered to potential users year-round and they will not need to wait for the next year to apply and get evaluated. This pilot 2022 call will have 4 cut-off dates but for 2023 6 cut-off dates are planned. Before the yearly call is launched and the rules are set, the Regional Facilities will be able to



Figure 4 - Calendar for the 2022 Physical Access Call



**Figure 5 - Physical Access application workflow**

decide on which cut-off dates they offer access, the number of access units and its modality, adapting this way the physical access to their availability and workload. As explained above, the access to EMSO Regional Facilities will be always open and proposals will be evaluated almost continuously. The first interaction with the user will be through a letter of intent in which the project proposal will be briefly described by the proponent. This letter of intent will be used to assign the more suitable Regional Facility to the applicant in order to prepare a complete project proposal. If the project proposal fulfills the evaluation thresholds, the project will take place unless better proposals are competing in the same cut-off date. A waiting list is foreseen for proposals that have passed the thresholds but have not been funded for the mentioned reason.

# EMSO ERIC Industry & Innovation

## ENVRI-FAIR INNOVATION WORKSHOP-BOOSTING ENVRI INNOVATION COOPERATION WITH INDUSTRY

EMSO ERIC organized on November 9th, 2021 the first “ENVRI-FAIR Innovation Workshop Boosting ENVRI innovation cooperation with Industry”, in the frame of the WP3 of ENVRI-FAIR Project.

The workshop aimed at discussing how to better unlock and exploit the innovation potential of Research Infrastructures and how to boost ENVRI cooperation with the industry as providers of advanced services, procurers of leading-edge technologies and partners in the development of new data-driven products and applications. To this aim, the event was conceived with three specific objectives:

- to present some examples of possible innovations carried out within the ENVRI community,
- to map the status of the collaboration between ENVRI and industry, and
- to introduce industry needs and expectations towards ENVRI.

The event had nine invited speakers, grouped in three main sessions organized according to the specific objectives above-mentioned, who gave presentations and participated in the two main open discussions and the final roundtable.

The first session was opened by the ENVRI-FAIR project coordinator, who provided an overview of the project purpose and activities with a focus on the potential of the RI services which could be interesting for the industry. Some services and innovation results were presented by representatives of LifeWatch ERIC and EMSO ERIC.

In the second session, representatives of the EOSC Association, ENRIITC and ACTRIS projects introduced the status of the collaboration between the Research Infrastructures and Industry, bringing initiatives for promoting and strengthening the collaborations between them.

The third and last session was devoted to gathering perspectives and needs of the industry, indeed, speakers in the third session outlined the perspectives of EARSC (European Association of Remote Sensing Companies), SEABASED and Ocean Energy Europe (OEE) Association and results coming from the E-SHAPE project. The workshop was targeted at Environmental Research Infrastructures members of the ENVRI community, and it was indeed announced through the ENVRI-FAIR mailing list. The event participation was very successful with attendees from all Europe.



## STRATEGY TO EXPLOIT THE INNOVATION POTENTIAL OF EUROPEAN RESEARCH INFRASTRUCTURES

Within the H2020 ENRIITC project, EMSO ERIC actively participated in building a permanent pan-European network of Industrial Liaison and Contact Officers (ILOs and ICOs) and enable the industry to become a full partner of research infrastructures (RIs) whether it is as a user, a supplier, or a co-creator. In other words, through its activities by supporting ILOs and ICOs, ENRIITC is helping to facilitate the establishment of strategic, cross-border partnerships between industry and RIs.

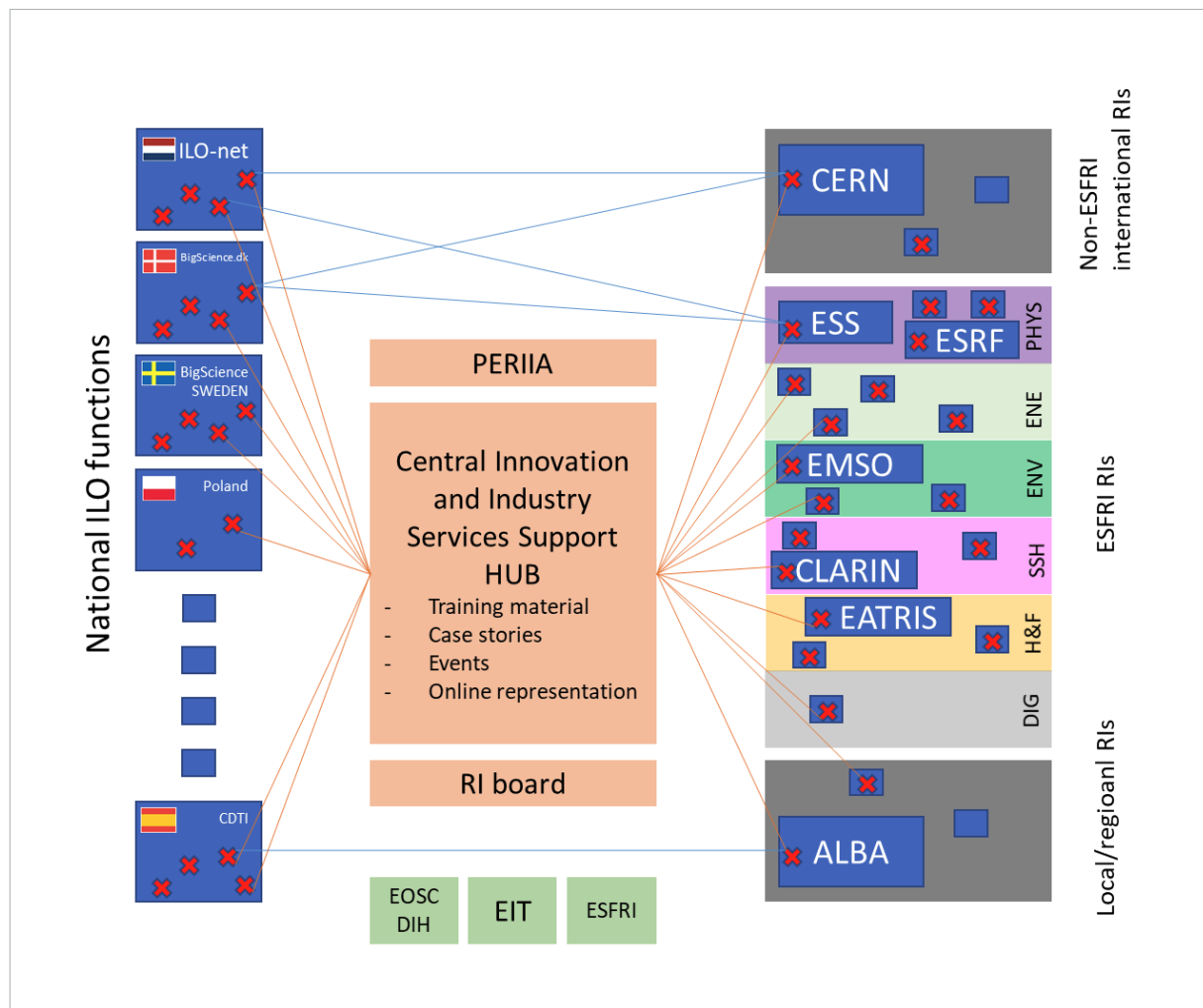


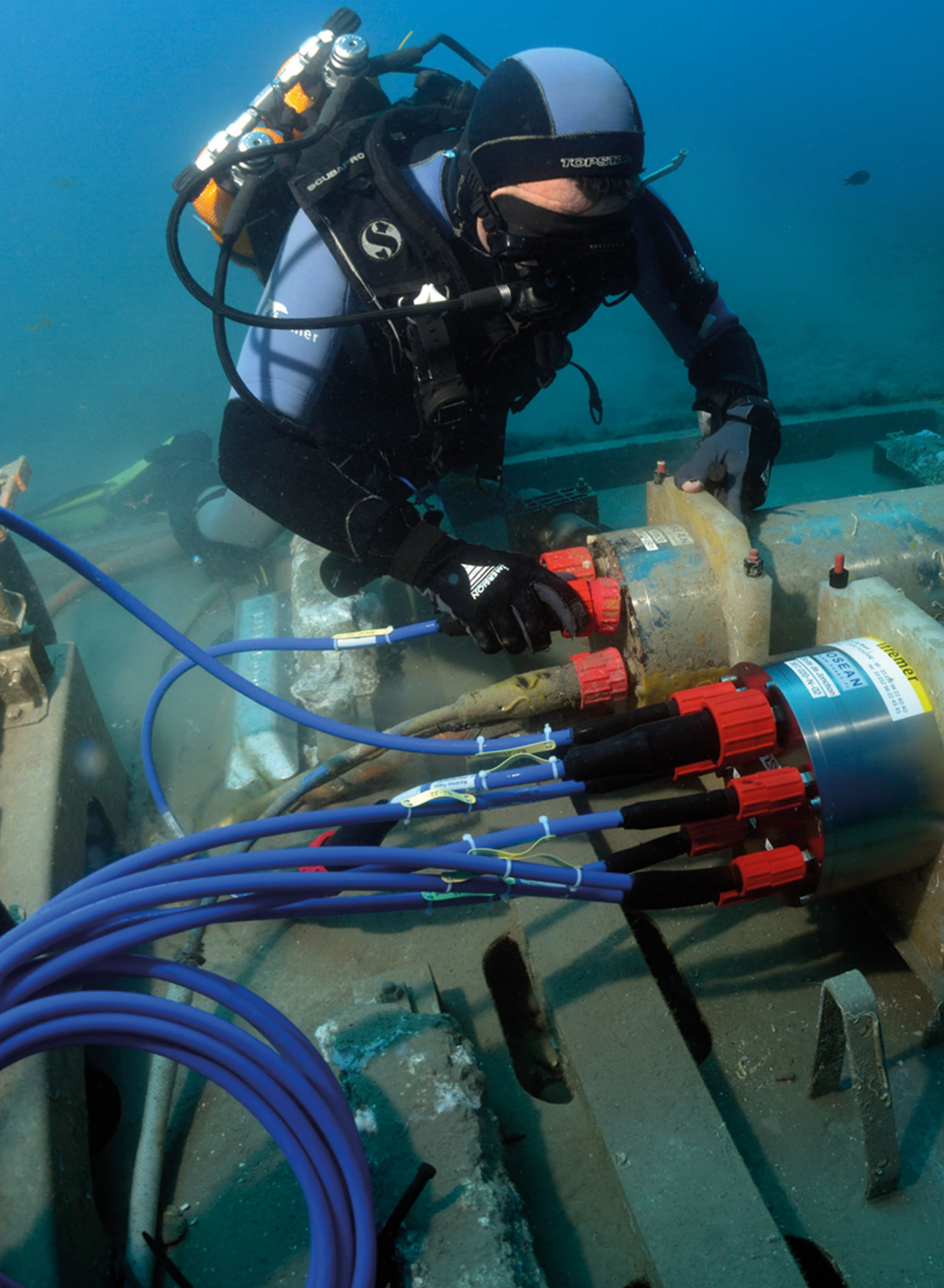
Figure 6 - Hub and spoke pan-European network for supporting RIs in building fruitful relationships with industry. Each red cross marks a person who can seek knowledge from the hub or the peers. It includes national ILOs and ICOs

Specifically, the EMSO Programme and Industry relations Officer has been the main author of the deliverable D3.1 “Strategy to exploit the innovation potential of RIs” in which he has proposed a “Research Infrastructures Innovation Preparedness Roadmap” as a further development of the model presented by EMSO in the deliverable D18.5 of the ENVRI-plus project to reach a readiness level in engaging the industry. The Roadmap consists of five key actions designed to help structure and organise the way RIs engage with the industry adding the substantial novelty of the European Hub-and-spoke network scheme to support EU RIs in this effort (Figure 7).

The five main actions foreseen in the roadmap are the following:

1. Establish a pan-European ICO/ILO network.
2. Adopt a set of core competencies for ICOs and ILOs.
3. Each RI should review and implement specific key actions.
4. Building strategic alliance relationships.
5. Develop a European Research and Knowledge Exchange Strategy tailored for RIs.

Finally, to identify the main challenges in building such a relationship, in the D3.1 of ENRIITC, the Marine sector has been used as a case study, taking advantage of the work performed during the H2020 Columbus project in the document “Use and sharing of marine observations and data by industry”.





# EMSO ERIC Communication

Communication is a transversal activity that supports and enhances the rest of the EMSO ERIC activities. The engagement of the new Communication Officer, at the beginning of 2021, has been an extraordinary impulse for the whole ERIC in a very short time, and we have significantly increased visibility and impact. Thus, EMSO ERIC already has a consolidated presence in social media, and active participation and dissemination in multiple activities like congresses, fairs and workshops, at a European and international level. All these achievements fostered a substantial increment of the followers on the EMSO social media profiles that places EMSO in the second position in the Marine ESFRI RIs for followers number.

EMSO ERIC is also working on communication key actions to increase the collaboration with other sister initiatives, to encourage the birth of new partnerships and to foster the visibility of the Marine RIs sector. Unfortunately, 2021 has been affected by the COVID-19 crisis, hugely impacting the number of in-person initiatives.

## EMSO Time-series Conference 2021 “Observing Ocean Sound”

A central event in 2021 was the organization of the three days EMSO Time Series Conference in October 2021 hosted by PLOCAN in Las Palmas de Gran Canaria, Spain (Figure 8).

This first edition of the EMSO Time Series conference (TSC2021) aimed to inform and train the ocean science community on the latest advancements in detecting and monitoring underwater sound for environmental and industrial purposes.

The increasing need to observe and monitor underwater sound for environmental and industrial purposes is faced with the challenge of the vastness of the marine space, the diversity of sound sources and receptors, and the high costs of acquiring representative and useful time-space resolution. This challenge calls for cost-effective solutions that need to address the whole acquisition chain, from sensors to platforms, communication, processing and data delivery. In-situ acoustic data acquisition devices and the processing to deliver meaningful time series data remain costly due to acquisition costs and the need for experts at each stage. Improved methods are needed to respond to legal and overarching international recommendations and prescriptions to reduce the impact of anthropogenic noise on the ocean. The European Marine Strategy Framework Directive asks the Member States to report on the state of underwater noise in their surrounding seas on a regular basis, and at international level the Internatio-





Figure 7 - EMSO TSC2021 website landing page

nal Quiet Ocean Experiment calls for improvements in our understanding of ocean soundscapes. The Global Ocean Observing System recently adopted ocean sound as an Essential Ocean Variable (EOV), with two sub-variables, sound pressure and sound particle velocity, necessary to characterise ocean sound and potential impacts on marine life.

Underwater sound can also provide cost-efficient information for the assessment of marine mammal populations, the detection of fish reproduction areas, the detection of greenhouse gas seeps from pipelines and deep-sea carbon storage, gasification of methane clathrates, adverse meteorological conditions, detection of low-frequency seismic events, ice-cracking, ocean basin sound-velocity tomography and acoustic communication. The conference was aimed, among others, to present all these topics and take stock of the situation in addressing them.

TSCs are scientific and training meetings on a specific topic with strong support from the IT team. EMSO ERIC launches a call every two years for organizing and hosting the next TSC (see Table 9). The call for the 2023 EMSO TSC will be launched in March 2022.

The training courses organized within the EMSO ERIC TSC2021 are the following:

1. Marine soundscapes: methods for the acquisition of ocean sound from fixed and mobile platforms. Trainers | **University of Pavia | Gianni Pavan**
2. Requirements and methods for the production of ocean noise time series, Acoustic data FAIRness, standard formats. Trainers | **Universitat Politècnica de Catalunya | Enoc Martinez, Daniel Mihai Toma, Joaquin del Rio**
3. PAM2Py – Passive Acoustic Monitoring for Python.  
Trainers | **University of Algarve | Ricardo Duarte, Orlando Camargo Rodriguez**
4. Methods for the detection and identification of marine mammals sounds.  
Trainers | **Monterey Bay Aquarium Research Institute | Danelle E. Cline, John Ryan**
5. Introduction to ocean particle velocity and measurement techniques.  
Trainers | **ISR LARSYS University of Algarve | Sergio M. Jesus, Paulo J. Santos**
6. Methods for the detection and analysis of anthropogenic sound in the oceans.  
Trainers | **INFN & INGV | Salvatore Viola, Francesco Simeone**

EMSO Time Series conference 2021
3-day programme with 8 keynote speakers and 12 trainers
More than 120 participants registered with 60 trainees working on EGI <sup>4</sup> and EMSO JupyterLabs
Scientific and Organizing Committee composed of 7 members
Two Meeting rooms at PLOCAN (attendees' arrangement)
29 posters presented during the Poster Session
Best poster award
Hybrid format: 2 mirrored rooms + ZOOM webinar
Digital brochure, printed copies, 2 roll-ups
Endorsement of UNESCO as an Ocean Decade activity, part of the action
"One Ocean Network for Deep Observation "

Table 9 - Some facts about the TSC2021

<sup>4</sup> <https://www.egi.eu/use-cases/research-infrastructures/emso/>

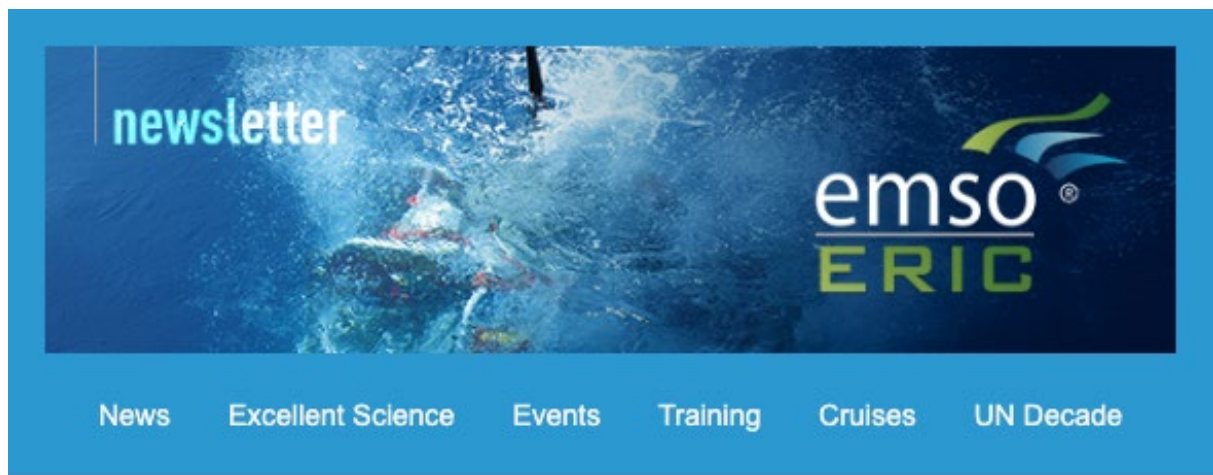
## EMSO ACADEMY

The work EMSO has done in the planning and running of the training activities related to the TSC2021 has represented the pilot action for the future EMSO Academy. Indeed, the EMSO Academy's main components will be:

1. An EMSO Doctoral Summer Schools: it will take place in one of the EMSO observatories to train the young researchers on the job, putting them in contact with the cutting-edge technology developed in the EMSO Regional Facilities.
2. Onsite Training Camps: oriented towards undergraduate and PhD students in the marine-related disciplines and to professionals of the sector. The objective is to train in developing theoretical and technological skills to grow the next generations of marine infrastructures researchers, technicians and entrepreneurs.
3. A Training Action Plan: made of a series of online training modules to be regularly updated with the latest discoveries and advancements in the marine fields.
4. an EMSO Talent-Attraction Exchange Program with internship and personnel exchange opportunities at the EMSO Regional Facilities and Central Management Office as part. The program will support skill development in marine science for industry and academia.

The plan is to launch the EMSO Academy in the second half of 2022.

## EMSO NEWSLETTER



### EMSO ERIC Internal Newsletter No.1 - July, 2021

Figure 8 - EMSO Newsletter header

An important goal achieved in 2021 has been the launch in June of the first issue of the EMSO Internal Newsletter managed by the brand-new Editorial Board led by GeoEcoMar. Initially conceived as a collective effort to share internal news, highlights and activities on Regional Facilities and CMO work with periodic issues throughout the year, the newsletter rapidly evolved into the fundamental backbone of the internal communication exchange. The Newsletter strongly participated in strengthening the EMSO identity building a mature and well-established mechanism for knowledge and best practices exchange. This hugely successful experience has served to plan a public newsletter for the year 2022 that will reach a wider community of stakeholders.

## EMSO SPECIAL ISSUE: “The Discovery of the Unknown Planet: The Ocean”

EMSO is the promoter of the Special Issue of the journal “Frontiers in Marine Science”.

The title of this special issue is “The Discovery of the Unknown Planet: the Ocean”<sup>5</sup> and appears under the themes “Deep-sea Environments and Ecology” and “Ocean Observation”. The topic editors are: Paolo Favali, Juan Danobeitia, Bruce M. Howe (Hawaii University) and Henry A. Ruhl (MBARI).

The issue is dealing with 25 contributions. In particular one merits to be highlighted “The role of the marine Research Infrastructures in the European landscape: present and future perspectives”. The authors are Juanjo Danobeitia, George Petihakis, Sylvie Pouliquen, Nicolas Pade, Christos Arvanitidis, Richard Sanders, Adrian Stanica, and Paolo Favali. This paper represents a “white paper” to figure out the integration process among marine Research Infrastructures (RIs).

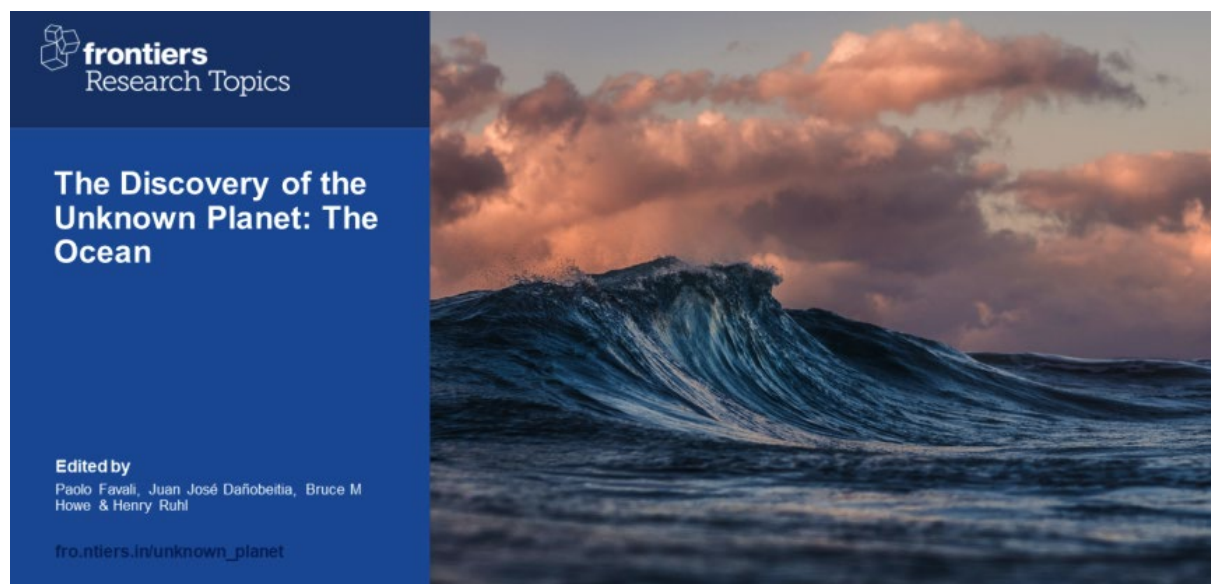


Figure 9 - The special issue's cover.

<sup>5</sup> <https://www.frontiersin.org/research-topics/18542/the-discovery-of-the-unknown-planet-theocean>

The RIs involved are:

- EMSO for fixed-point deep-sea and water column observatories (Eulerian)
- Euro-Argo for profiling floats (Lagrangian)
- LifeWatch for biodiversity and ecosystem research
- EMBRC for studying marine biological resources
- ICOS-Marine for carbon dioxide and GHG observations in the ocean, atmosphere (and land)
- DANUBIUS-RI for river-sea interactions.

Each of these infrastructures has its own specific area of activity, but they show many complementarities, with some degree of overlapping, both of which are necessary for the approach of an interrelated Earth system. They aim to strengthen collaboration and favour synergies between them towards an integrated interdisciplinary approach. The goals of these infrastructures are perfectly aligned with the key priorities of the UN Decade of Ocean Science for Sustainable Development (2021-2030), and with the main goals of the EC Horizon Europe framework programme (2021-2027).

## EMSO RECRUITMENT ACTIVITIES

At EMSO ERIC we have made a prudent management of personnel and according to the available resources during 2021 four positions have been tendered. We have also followed the DG's commitment in the 15th AoM on modifying the recruitment systems in order to achieve greater participation of candidates. The vacancies published in 2021 and the outcomes of the communication campaigns are the following:

### **Programme and Industry relationships Officer**

- Open date: August 3rd, 2021
- Application deadline: October 15th, 2021
- Estimated starting date: December 1st, 2021, delayed to early 2022 for technical reasons
- Number of applicants: 110

### **Policy and Project Management Officer**

- Open date: August 27th, 2021
- Application deadline: October 22nd, 2021
- Estimated starting date: December 1st, 2021, delayed to early 2022 for technical reasons
- Number of applicants: 190

### DevOps Cloud and Technical Support Engineer

- Open date: July 23rd, 2021
- Application deadline: September 15th, 2021
- Estimated starting date: October 15th, 2021, delayed to early 2022 for technical reasons
- Number of applicants: 20

### Engineering and Logistics Officer

- Open date: March 23rd, 2021
- Application deadline: May 21st, 2021
- Starting date: September 15th, 2021
- Number of applicants: 4

### Communication channels used during the recruitment campaigns:

- LinkedIn
- Facebook
- Twitter
- EMSO website

## EMSO WEBSITE

The EMSO website is the primary source of information for the stakeholders and the general public, and it is conceived as a living instrument describing the activities and results achieved within EMSO ERIC. The number of users has grown in 2021 by +39,76% compared to the previous year, and their spatial distribution spread all over the world. In Table 8, the user's number, the sessions' number and the page views are reported for 2019, 2020 and 2021:

	2019	2020	2021
<b>Users</b>	9.998	12.260	17.350
<b>Sessions</b>	15.663	18.480	23.977
<b>Page views</b>	33.764	37.326	42.151

Table 10 - Web users' comparison between 2019, 2020 and 2021

The Data Portal<sup>6</sup> and the page on the Physical Access<sup>7</sup> to the infrastructure have been strongly improved in 2021 with new information and tools for data manipulation. The huge success of the EMSO Data Services, also showcased on the European Open Science Cloud (EOSC) Digital Innovation Hub (DIH)<sup>8</sup> portal, and of the Time Series Conference 2021 have attracted an increased number of users of the website making it even more a fundamental piece in the EMSO communication strategy.

For 2022, the launch of the EMSO Academy will bring to the development of a new area dedicated to it on the website together with the opening of a Training Platform for the management of the training courses planned in the academy programme.

## EMSO SOCIAL CHANNELS

The EMSO social media channels (Facebook, Twitter, LinkedIn) have been continuously updated during the year to share information about consortium activities, updates on observatories' initiatives, scientific results achieved by the EMSO community, funding call opportunities, job opportunities, events and other topics of interest for the community.

Here is a short summary of each EMSO social profile data and achievement.

### Facebook (2021)

556 people follow the page, and this number has continuously grown since January 7th, 2017. The posts recorded the different activities developed by the whole partnership from conferences to the great success of a publication and outcomes of the projects and also advertised the collaborations going on between EMSO ERIC and other Organizations.

### Twitter (2021)

EMSO's Twitter account at the end of 2021 counts 1548 followers compared to 1241 in December 2020. This channel has been used to share mainly the partner's activities abroad and spread information about international activities and "sister infrastructures" to the EMSO community. All the partners have been invited to cite the EMSO Twitter account giving them the chance to increase their visibility.

### LinkedIn (2021)

EMSO's LinkedIn account has 861 followers with an increase of +225% compared to December 2020. Most of these followers work in the research field, but many different workers are educators, media and communication experts and business developers.

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<sup>6</sup> <https://data.emso.eu/>

<sup>7</sup> <https://emso.eu/physical-access/>

<sup>8</sup> <https://eosc-dih.eu/list-of-all-services/>



## EMSO ERIC ZENODO Community

Another important goal achieved by the EMSO Communication in 2021 is the opening of the EMSO ERIC community on ZENODO<sup>9</sup>.

ZENODO<sup>10</sup> is a certified Open Access repository directly managed by CERN through the OpenAIRE project<sup>11</sup> and it is compliant with the OpenAIRE Guidelines v3.0. ZENODO helps researchers receive credit by making the research results citable and through OpenAIRE integrates them into existing reporting lines to funding agencies like the European Commission. In addition, citation information is also passed to DataCite and onto the scholarly aggregators. The ZENODO Community enables EMSO to have an Open Repository for all our public documents and for scientific papers produced under the EMSO activities.

The screenshot shows the Zenodo community landing page for EMSO ERIC. The header is blue with the Zenodo logo on the left, a search bar in the center, and 'Upload' and 'Communities' links on the right. Further right are 'Log in' and 'Sign up' buttons. The main heading is 'EMSO ERIC, The European Multidisciplinary Seafloor and water column Observatory'. Below this is a 'Recent uploads' section. It includes a search bar and two upload entries. The first entry is 'EMSO ERIC GENDER EQUALITY PLAN' by Valentina Tegas, Maria Fredella, Juanjo Dañobeitia, Laura Beranzoli, and Aleardo Furlani, dated March 23, 2022. The second entry is 'EMSO ERIC Long-term vision and strategic plan 2021-2023' by Juanjo Dañobeitia, Paolo Favali, and Marco Galeotti, dated November 21, 2021. To the right of the uploads is a 'New upload' button and a community profile for 'emso ERIC' with its logo and a description of the observatory.

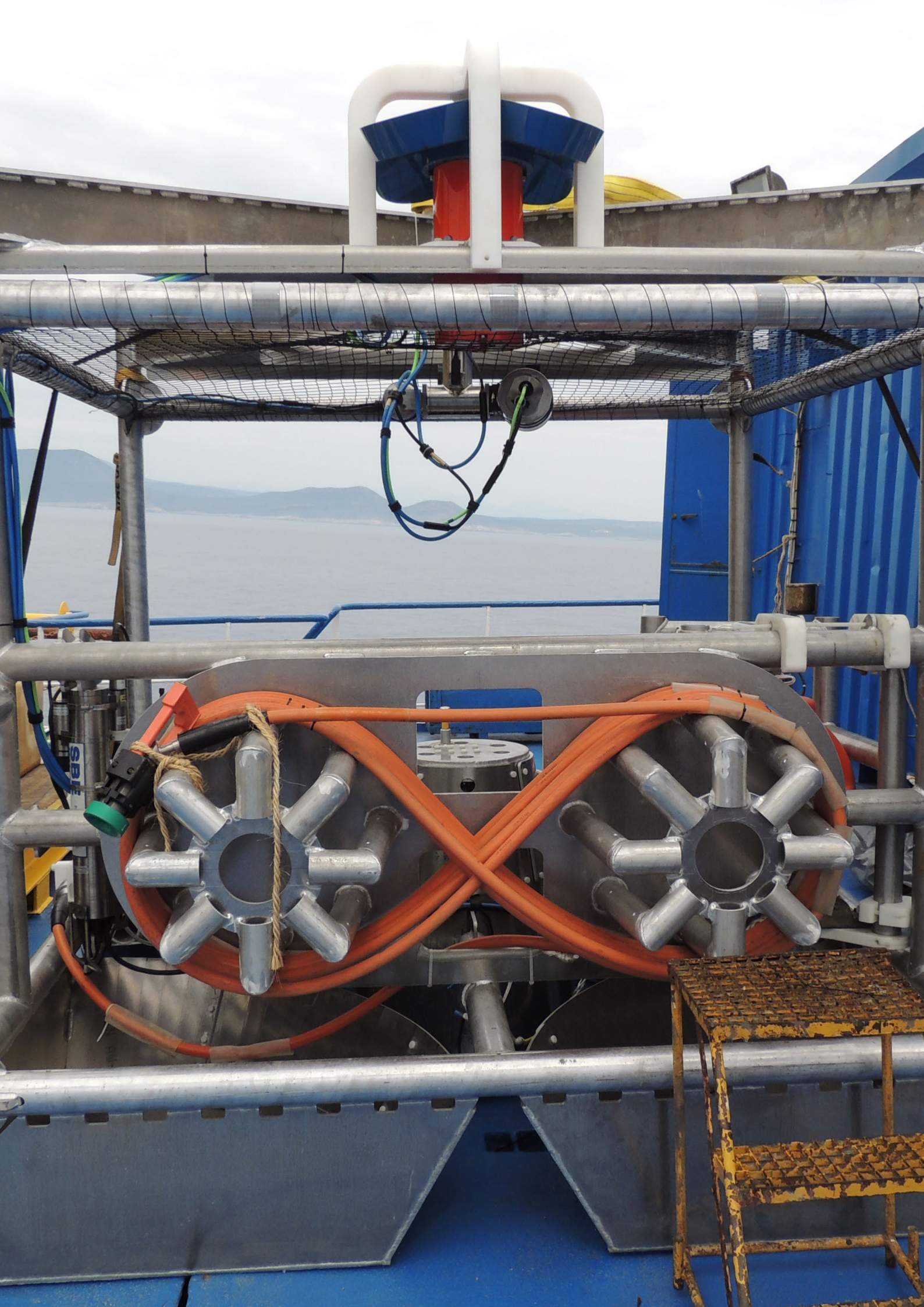
Figure 10 - The EMSO ERIC Zenodo community landing page

<sup>9</sup> <https://zenodo.org/communities/emso-eric/>

<sup>10</sup> <https://zenodo.org/>

<sup>11</sup> <https://www.openaire.eu/>







# EMSO ERIC

## Looking ahead

The ocean regulates the exchange<sup>12</sup>, storage and release of carbon dioxide, controls the climate, absorbs most of the heat excess from greenhouse gas emissions in the atmosphere (Zanna et al., 2019) and the life within it produces about half of the oxygen that we breathe.

Multi-platform RIs such as EMSO ERIC, have proven to be an effective strategy in the ocean observation system, and a promising one to face the global challenges that affect the Ocean and therefore the entire planet. The General Assembly of the United Nations, by approving and supporting the UN Decade of the Ocean Science for Sustainable Development (2021-2030), offers to the entire Marine community and society in general a once-in-a-lifetime opportunity to change the way of deepening marine knowledge, adjusting to sustainable development and preserving the health of the oceans as a legacy asset to future generations (Ryabinin et al., 2019).

In this respect, in 2021 EMSO ERIC confirmed its leading role in the European Marine sector specifically putting an extraordinary effort in drafting the European strategies to enhance the relationships between EU RIs and the industry. The industry could indeed help to increase the socio-economic impact of RIs on the European societies, bringing the EU RIs at the center of the European Innovation Ecosystem. EMSO in addition actively participated in the conference on EC Ocean Observation organized by the Directorate General for Maritime Affairs and Fisheries Integrated Maritime Policy (EC Ocean Observation, Report & Community Recommendations, (Oct 2021) to give its contribution in shaping the future of the sector.

The incorporation of Norway in January increased the Regional Facilities reached the number of fifteen, and what is more noticeable is that now EMSO is present in the Arctic waters.

EMSO ERIC in 2021 has also consolidated the path in becoming a world-class Marine Research Infrastructure by providing high-quality information on the significance and the dynamics of the deep oceans and the water column, helping to address the global ocean environmental challenges affecting the Earth System, and impact the well-being of society.

In 2022, EMSO ERIC plans to reach the fully operational phase with the first call of Physical Access and the launch of the EMSO Academy in the second half of the year.

A central objective of EMSO ERIC, shown in the EMSO ERIC Strategic Plan 2020-23<sup>13</sup> will be even more to provide quality-controlled data, qualified information and knowledge, based on a multidisciplinary monitoring of EOVs in EMSO ERIC regional facilities that allow a better understanding of the global en-

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<sup>12</sup> Dañobeitia et al., 2022  
EC Ocean Observation: Sharing Responsibility, Report & community Recommendations from event 18th July 2021

<sup>13</sup> 10.5281/zenodo.5840068

vironmental process in address three main topics (Ocean-Atmosphere, Biosphere/Marine ecosystems, and Geosphere/ seafloor Geo-hazards and Geodynamics). But in addition more and more relevance will be put on the service provision in order to increase the impact, serve the community and engage the industry as a user, a supplier and a co-developer.

In this respect, five categories of science services are identified:

- Two categories of services addressing the Geosphere and the Biosphere, namely: (1) Geo-hazards and Geodynamics and (3) Marine Ecology and Biodiversity.
- Two categories of services addressing the Atmosphere and the Ocean/Climate Change, namely: (2) Water-column Physics and Biogeochemistry and (5) Meteorological parameters.
- A fifth category corresponds to environmental monitoring services that meet or have the potential to meet statutory obligations under several legislative frameworks (Marine Strategy Framework Directive, Common Fisheries Policy, Habitats Directive, Water Framework Directive, and Maritime Spatial Planning Directive), namely (4) Environmental indicators (Marine Strategy Framework Directive).

The main impact expected from EMSO implementation and further development includes:

- Provision off new services and products for stakeholders (e.g., EMODnet and Copernicus) in order to:
  - o understand and manage the consequences of climate change, ocean acidification, natural risks,
  - o deliver outstanding information and applications to understand the interacting processes in the marine environment among other key topics.
- Improvement of the health of the European oceans through the research and the interdisciplinary approach in the framework of a European-international collaboration with other environmental research infrastructures, programmes, initiatives and organizations.
- Exploitation of new sources of knowledge, information and education to advance oceanic literacy and understanding of the phenomena that affect our daily life and our economy through initiatives such as the EU Blue Growth, and by taking advantage of the potential of Europe's oceans for the creation of blue jobs and economic growth.

According to the High-Level Expert Group assessment EMSO is now ranked at RL5 and plans to progress to RL6 in compliance with FAIR principles for data and services, as defined by the European Open Science Cloud. The EMSO plan of the activities for 2022 and 2023 is presented in the “EMSO ERIC Long-term vision and strategic plan”.

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<sup>14</sup> <https://eosc-portal.eu/>

<sup>15</sup> 10.5281/zenodo.5840068

# EMSO ERIC

## Annex 1

### List of the EMSO regional teams

Regional Team	Team members	Name	Affiliation
<b>Azores</b>	Team Leader	Sarradin Pierre Marie	Ifremer
	Science SG	Cannat Mathilde	CNRS
	Data SG	Van Iseghem Sylvie	Ifremer
	Eng&Log SG	Blandin Jérôme	Ifremer
	Comm SG	Sarrazin Jozée	Ifremer
	IISG	Helen Leau	Ifremer
<b>Black Sea</b>	Team Leader	Radulescu Vlad	GeoEcoMar
	Science SG	Raluca Tutuianu	GeoEcoMar
	Data SG	Raluca Radulescu	GeoEcoMar
	Eng&Log SG	Rucihan Ali Deversi	GeoEcoMar
	Comm SG	Dinicoiou Mirela	GeoEcoMar
	IISG	Ivan Iulia	GeoEcoMar
<b>Canary Islands</b>	Team Leader	Delory Eric	PLOCAN
	Science SG	Delory Eric	PLOCAN
	Data SG	Gonzalez Javier	PLOCAN
	Eng&Log SG	Monagas Vidina	PLOCAN
	Comm SG	Loustau Josefina	PLOCAN
	IISG	Castro Ayoze	PLOCAN
<b>Hellenic Arc</b>	Team Leader	Petihakis George	HCMR
	Science SG	Perivoliotis Leonidas	HCMR
	Data SG	Sotiropoulou Maria	HCMR
	Eng&Log SG	Pagonis Paris	HCMR
	Comm SG	Christodoulaki Sylvia	HCMR
	IISG	Frangoulis Costas	HCMR

Regional Team	Team members	Name	Affiliation
<b>Iberian Margin</b>	Team Leader	Zuzia Stroynowski	IPMA
	Science SG	Colaço Ana	University of the Azores -IMAR
	Data SG	Relvas Paulo	Universidade do Algarve (CCMAR/FCT)
	Eng&Log SG	Silva Eduardo	INESC TEC
	Comm SG	Sebastião Luis	ISR- Instituto Superior Tecnico, Portugal
	IISG	Vilhena Lourenco Nuno	IPMA
<b>Ligurian Sea</b>	Team Leader	Coppola Laurent	Lab. Océanographique de Villefranche
	Science SG	Lefevre Dominique	MIO- CNRS
	Data SG	Carval Thierry	ifremer
	Eng&Log SG	Gojak Carl	Division Technique de l'INSU
	Comm SG	TBD	
	IISG	Hello Yann	Geoazur - Université Côte d'Azur
<b>Porcupine Abyssal Plain</b>	Team Leader	Hartman Susan	NOC
	Science SG	Gate Andrew	NOC
	Data SG	Snaith Helen	NOC
	Eng&Log SG	Cardwell Chris	NOC
	Comm SG	Pebody Corinne	NOC
	IISG	Alexiou Sofia	NOC
<b>Western Ionian Sea</b>	Team Leader	Embriaco Davide	INGV
	Science SG	Lo Bue Nadia	INGV
	Data SG	Fратиanni Claudia	INGV
	Eng&Log SG	Marinaro Giuditta	INGV
	Comm SG	Giuntini Alessandra	INGV
	IISG	Papaleo Riccardo	INGV - INFN
<b>Molène</b>	Team Leader	Lanteri Nadine	Ifremer
	Science SG	Garziglia Sébastien	Ifremer
	Data SG	Libes Maurice	OSU Pytheas - CNRS
	Eng&Log SG	Ciausui Viorel	Ifremer
	Comm SG	Chloé Batissois	Ifremer
	IISG	Barbero Aurore	Ifremer

Regional Team	Team members	Name	Affiliation
<b>OBSEA</b>	Team Leader	Del Rio Joaquin	UPC
	Science SG	Mihai Toma Daniel	UPC
	Data SG	Martinez Enoc	UPC
	Eng&Log SG	Nogueras Marc	UPC
	Comm SG	Neus Vidal	UPC
	IISG	Del Rio Joaquin	UPC
<b>SmartBay</b>	Team Leader	Berry Alan	MARINE INSTITUTE
		Gaughan Paul	MARINE INSTITUTE
	Data SG	Thomas Rob	MARINE INSTITUTE
	Eng&Log SG	O'Malley Conall	MARINE INSTITUTE
	Comm SG	Felicity Donnelly	MARINE INSTITUTE
	IISG	Reilly Kieran	MARINE INSTITUTE
<b>Nordic Seas</b>	Team Leader	Ilker Fer	University of Bergen
	Science SG	Ingunn Skjelvan	Norwegian Research Centre and Bjerknes Centre for Climate Research
	Data SG	Rocio Castano Primo	University of Bergen
	Eng&Log SG	Beatrice Tomasi	
	Comm SG	Lucie Mottlova	University of Bergen
	IISG	TDB	
<b>Western Mediterranean Sea</b>	Team Leader	Bozzano Roberto	CNR Istituto per lo studio degli impatti Antropici e Sostenibilità in ambiente marino
	Science SG	Bozzano Roberto	CNR Istituto per lo studio degli impatti Antropici e Sostenibilità in ambiente marino
	Data SG	Pensieri Sara	CNR Istituto per lo studio degli impatti Antropici e Sostenibilità in ambiente marino
	Eng&Log SG	Pensieri Sara	CNR Istituto per lo studio degli impatti Antropici e Sostenibilità in ambiente marino
	Comm SG	Evangelista Lorenza	CNR
	IISG	Magnifico Giuseppe	CNR



Regional Team	Team members	Name	Affiliation
<b>South Adriatic Sea</b>	Team Leader	<b>Cardin Vanessa</b>	OGS Istituto Nazionale di Oceanografia e Geofisica Sperimentale
	Science SG	<b>Miserocchi Stefano</b>	CNR - Istituto per le Scienze Polari
	Data SG	<b>Partescano Elena</b>	OGS Istituto Nazionale di Oceanografia e Geofisica Sperimentale
	Eng&Log SG	<b>Brunetti Fabio</b>	OGS Istituto Nazionale di Oceanografia e Geofisica Sperimentale
	Comm SG	<b>Petrera Francesca</b>	OGS Istituto Nazionale di Oceanografia e Geofisica Sperimentale
	IISG	<b>TBD</b>	
<b>Cretan Sea</b>	Team Leader	<b>Petihakis George</b>	HCMR Hellenic Centre for Marine Research - Institute of Oceanography
	Science SG	<b>Petihakis George</b>	HCMR Hellenic Centre for Marine Research - Institute of Oceanography
	Data SG	<b>Perivoliotis Leonidas</b>	HCMR Hellenic Centre for Marine Research - Institute of Oceanography
	Eng&Log SG	<b>Pagonis Pagonis</b>	HCMR Hellenic Centre for Marine Research - Institute of Oceanography
	Comm SG	<b>Christodoulaki Sylvia</b>	HCMR Hellenic Centre for Marine Research - Institute of Oceanography
	IISG	<b>Frangoulis Constantin</b>	HCMR Hellenic Centre for Marine Research - Institute of Oceanography

## EMSO ERIC

### Annex 2

## Detailed description of the Regional facilities by Member countries

### FRANCE

#### REPRESENTING ENTITIES:

Institut Français de Recherche pour l'exploitation de la Mer | IFREMER  
Centre National de la Recherche Scientifique | CNRS

#### REGIONAL FACILITIES 3

### EMSO AZORES

#### SCIENTIFIC OBJECTIVES

Understand the links between geological, physical and chemical processes and their effects on the dynamics of the hydrothermal fauna at different spatial and temporal scales at the Lucky Strike vent field.

#### GENERAL INFORMATION

**Location:** Mid-Atlantic ridge near Azores

**Distance from land:** 200 NM

**Max water depth:** 1700 m

**Date 1<sup>st</sup> deployment:** October 2010

**Operated by:** IFREMER, CNRS

**Website:** [www.emso-fr.org](http://www.emso-fr.org)

**Status:** running (updated November 2017)

**Regional Team Leader:** Pierre-Marie Sarradin, Ifremer

SCIENCE SERVICE CATEGORY	SCIENCE SERVICE NAME
Access	Access
METEOROLOGICAL PARAMETERS	Meteorological parameters
WATER COLUMN PHYSICS AND BIOGEOCHEMISTRY	Water mass characterisation
MARINE ECOLOGY AND BIODIVERSITY	Hydrothermal vents faunal and ecosystem response
GEOHAZARDS AND GEODYNAMICS	Seafloor geodesy
GEOHAZARDS AND GEODYNAMICS	Local seismicity
GEOHAZARDS AND GEODYNAMICS	Dynamics of mid atlantic ridge hydrothermal system
ENVIRONMENTAL INDICATORS (MSFD)	Underwater sound monitoring
ENVIRONMENTAL INDICATORS (MSFD)	Seafloor environmental parameters

## EMSO-MOLÈNE

### SCIENTIFIC OBJECTIVES

Test of marine sensors to help manufacturers, platform operators and scientists to validate instruments.

### GENERAL INFORMATION

**Location:** Near Molène Island

**Distance from land:** 2 km

**Max water depth:** 1 m

**Date 1<sup>st</sup> deployment:** 2012

**Operated by:** IFREMER

**Website:** [www.emso-fr.org](http://www.emso-fr.org)

**Status:**

**Regional Team Leader:** Nadine Lantéri, Ifremer

### SUMMARY

The Molène archipelago is part of the Natural Marine Parc d'Iroise, a marine protected area hosting a rich biodiversity and biomass with the largest seaweed field in Europe, a wide range of benthic organism, endangered bird species and marine mammals, including bottlenose dolphins and seals. EMSO-Molène is a pilot for a new generation of multidisciplinary cabled and coastal observatories, based on reliable proven off the shelf technologies. The technologies were used in the design of the observatory EMSO-Ligure Nice.

## LIGURIAN SEA

### SCIENTIFIC OBJECTIVES

Multidisciplinary long-term eulerian monitoring to study the slope failure processes on the continental slope (Nice site), water mass properties, biogeochemical cycles and biological communities modifications in response to climate change and anthropogenic pressure (open sea platforms) and geo-hazards assessment with the monitoring of earthquakes and tsunamis.

### GENERAL INFORMATION

**Location:** Mediterranean Sea, South of France

**Distance from land:** 42 km (Western Ligurian), 1 km (Nice), 50 km (Dyfamed)

**Max water depth:** 2400 m (Western Ligurian), 20-35 m (Nice), 2300 m (Dyfamed)

**Date 1<sup>st</sup> deployment:** October 2015 (Nice), 1998 and 1999 (Dyfamed), 2007 and 2010 (Western Ligurian)

**Operated by:** CNRS, IFREMER

**Website:** [www.emso-fr.org](http://www.emso-fr.org)

**Status:** running/in maintenance/in development (updated November 2017)

**Regional Team Leader:** Laurent Coppola, CNRS/UPMC

SCIENCE SERVICE CATEGORY	SCIENCE SERVICE NAME
Access	Access
WATER COLUMN PHYSICS AND BIOGEOCHEMISTRY	Water mass characterization: Hydrodynamic changes in the water column
	Biogeochemical cycles: Impacts of the deep and dense water formation and Evolution of the carbon pump
GEOHAZARDS AND GEODYNAMICS	Geohazard: Slope failure processes on a steep continental slope
	Geohazard: Seismic hazard, tsunami generation

# GREECE

## REPRESENTING ENTITY:

Hellenic Centre for Marine Research | HCMR

## REGIONAL FACILITY 1

## HELLENIC ARC

### SCIENTIFIC OBJECTIVES

Real-time long-term monitoring of oceanic circulation, deep-sea processes and ecosystems evolution. Study of episodic events such as earthquakes, submarine slides, tsunamis, benthic storms, biodiversity changes, pollution. Simultaneous data are relative to: seismology, geodesy, sea level, fluid and gas vents, physical oceanography and biodiversity imaging at different scales.

### GENERAL INFORMATION

**Location:** Mediterranean Sea, Hellenic Arc

**Distance from land:** 12 NM

**Max water depth:** 1700 m

**Date 1<sup>st</sup> deployment:** May 2007

**Operated by:** HCMR

**Website:** [poseidon.hcmr.gr](http://poseidon.hcmr.gr)

**Status:** running/in development (updated November 2017)

**Regional Team Leader:** George Petihakis, HCMR

SCIENCE SERVICE CATEGORY	SCIENCE SERVICE NAME
Access	Access
METEOROLOGICAL PARAMETERS	Meteorological parameters
WATER COLUMN PHYSICS AND BIOGEOCHEMISTRY	Water column environmental parameters
GEOHAZARDS AND GEODYNAMICS	Geohazard
ENVIRONMENTAL INDICATORS (MSFD)	Underwater sound monitoring

# IRELAND

REPRESENTING ENTITY:  
Marine Institute | MI  
REGIONAL FACILITY 1

## SMARTBAY

### SCIENTIFIC OBJECTIVES

Test of marine sensors to help manufacturers, platform operators and scientists to validate instruments.

### GENERAL INFORMATION

**Location:** Galway Bay, Ireland  
**Distance from land:** 1.5 or 5 km  
**Max water depth:** 27 m  
**Date 1<sup>st</sup> deployment:** August 2015  
**Operated by:** Marine Institute  
**Website:** smartbay.marine.ie  
**Status:** test site, fully operational (updated November 2017)  
**Regional Team Leader:** Alan Berry, MI

SCIENCE SERVICE CATEGORY	SCIENCE SERVICE NAME
Access	Access
MARINE ECOLOGY AND BIODIVERSITY	Benthic Monitoring
ENVIRONMENTAL INDICATORS (MSFD)	Environmental parameters
	Underwater Noise Monitoring and BioAcoustics



# ITALY

## REPRESENTING ENTITY:

Istituto Nazionale di Geofisica e Vulcanologia | INGV

## REGIONAL FACILITY 1

## WESTERN IONIAN SEA

### SCIENTIFIC OBJECTIVES

Geo hazards assessment with the real-time monitoring of earthquakes and tsunamis. Physical oceanographic parameters and water mass properties at the seafloor and along the water column. Time variations of terrestrial potential fields and electrical properties. Marine acoustic noise characterization and bio-acoustic tracking. Rheological properties of solid matter.

### GENERAL INFORMATION

**Location:** Mediterranean Sea, East of Sicily

**Distance from land:** 25 km

**Max water depth:** 2100 m

**Date 1<sup>st</sup> deployment:** 2001

**Operated by:** INGV, INFN, CNR

**Website:** [www.moist.it/sites/western\\_ionian\\_sea/2](http://www.moist.it/sites/western_ionian_sea/2)

**Status:** running for ONDE-SMO, NEMO-SN1 recovered in 2013, mooring recovered in 2017 (updated November 2017)

**Regional Team Leader:** Davide Embriaco, INGV

SCIENCE SERVICE CATEGORY	SCIENCE SERVICE NAME
Access	Access
WATER COLUMN PHYSICS AND BIOGEOCHEMISTRY	Water masses characterization: monitoring of deep dynamics and variability of the water column
	Geohazards: quality check through probability PSD tool
	Geohazards: trigger for seismic events
	Geohazards: trigger for volcanic fall-out
GEOHAZARDS AND GEODYNAMICS	Tsunami detection
	Underwater Acoustic Noise Monitoring
ENVIRONMENTAL INDICATORS (MSFD)	

## PORTUGAL

### REPRESENTING ENTITY:

Fundação para a Ciência e a Tecnologia | FCT

### REGIONAL FACILITY 1

## IBERIAN MARGIN

### SCIENTIFIC OBJECTIVES

#### GENERAL INFORMATION

**Location:** Gulf of Cadiz and North Portugal continental shelf

**Distance from land:** to be defined

**Max water depth:** to be defined

**Date 1<sup>st</sup> deployment:** July 2020

**Operated by:** EMSO Portugal

**Website:** emso-pt.pt

**Status:** in procurement (updated December 2019)

**Regional Team Leader:** Zuzia Stroynowski, IPMA

#### SUMMARY

The area of Cadiz is very important for geo-hazards. It was the site where one of the worst earthquakes that hit Europe occurred in 1755, coupled with a destructive tsunami. Here African and European tectonic plates converge. It is a seismic volcanic region. It is also the site to investigate the flow that from Mediterranean moves into the Atlantic and affects the deep-water circulation on a global scale. The geologic and oceanographic features of this region favour the presence of highly diverse benthic communities and have also a central role in the distribution of several marine mammals and fish species.

**Planned EMSO scientific disciplines:** geosciences, physical oceanography, biogeochemistry, marine ecology.

# ROMANIA

## REPRESENTING ENTITY:

Institutul National de Cercetare

Dezvoltare Pentru Geologie si Geoecologie Marina | GEOECOMAR

## REGIONAL FACILITY 1

## BLACK SEA

### SCIENTIFIC OBJECTIVES

Long-term environmental monitoring and for the prevention/mitigation of the marine geo hazards.

### GENERAL INFORMATION

**Location:** Three sites in the Black Sea

**Distance from land:** 180 km

**Max water depth:** 95 m

**Date 1<sup>st</sup> deployment:** June 2013

**Supported by:** Romania

**Operated by:** GeoEcoMar

**Website:**

**Status:** running (updated November 2017)

**Regional Team Leader:** Vlad Rădulescu, GeoEcoMar

SCIENCE SERVICE CATEGORY	SCIENCE SERVICE NAME
Access	Access
METEOROLOGICAL PARAMETERS	Meteorological characterization
ENVIRONMENTAL INDICATORS (MSFD)	Hydrodynamic changes on the seafloor

## SPAIN

REPRESENTING ENTITY:

Plataforma Oceánica de Canarias | PLOCAN

REGIONAL FACILITIES 2

## EMSO CANARIAS

### SCIENTIFIC OBJECTIVES

Long-term changes of stratification and circulation on seasonal and inter-annual times scales of the subtropical Central-Eastern waters of the Atlantic Ocean.

### GENERAL INFORMATION

**Location:** Atlantic Ocean near Canary Islands

**Distance from land:** 112 km

**Max water depth:** 3630 m

**Date 1<sup>st</sup> deployment:** 1994

**Operated by:** PLOCAN

**Website:** [plocan.eu/en/open-ocean-observatory](http://plocan.eu/en/open-ocean-observatory)

**Status:** running (updated May 2020)

**Regional Team Leader:** Eric Delory, PLOCAN

SCIENCE SERVICE CATEGORY	SCIENCE SERVICE NAME
Access	Access
METEOROLOGICAL PARAMETERS	Meteorological parameters
WATER COLUMN PHYSICS AND BIOGEOCHEMISTRY	Hydrography (Currents, Salinity, Temperature, Pressure)
	Biogeochemistry (Oxygen, Nutrients, Chlorophyll, Turbidity, Carbon system, Particle flux)
ENVIRONMENTAL INDICATORS (MSFD)	PLOCAN Underwater Sound service

## OBSEA

### SCIENTIFIC OBJECTIVES

Test of marine sensors to help manufacturers, platform operators and scientists to validate instruments.

### GENERAL INFORMATION

**Location:** Balearic Sea, South of Spain coast

**Distance from land:** 4 km

**Max water depth:** 20 m

**Date 1<sup>st</sup> deployment:** 2009

**Operated by:** Universitat Politècnica de Catalunya, UPC

**Website:** [www.obsea.es](http://www.obsea.es)

**Status:** test site running (updated November 2017)

**Regional Team Leader:** Del Rio Joaquin, UPC

SCIENCE SERVICE CATEGORY	SCIENCE SERVICE NAME
Access	Access
METEOROLOGICAL PARAMETERS	Meteorological parameters
MARINE ECOLOGY AND BIODIVERSITY	Seafloor environmental parameters
GEOHAZARDS AND GEODYNAMICS	Geohazard (earthquake)
ENVIRONMENTAL INDICATORS (MSFD)	Seafloor environmental parameters
	Underwater sound monitoring

**UK**

**REPRESENTING ENTITY:**

National Oceanography Centre | NOC

**REGIONAL FACILITY 1**

## PORCUPINE ABYSSAL PLAIN

### SCIENTIFIC OBJECTIVES

Study the connections between the lower atmosphere, water column and seafloor at a deep ocean site in the Northeast Atlantic, understanding ecosystem function especially related to carbon sequestration dynamics.

### GENERAL INFORMATION

**Location:** North East Atlantic Ocean, abyssal plain

**Distance from land:** 300 miles

**Max water depth:** 4850 m at the PAP-SO

**Date 1<sup>st</sup> deployment:** First operations 1985 (RRS Challenger 6A/85), First long-term moored instrumentation 1991 (Bathysnap, RRS Challenger 79), PAP3 sediment traps from 1989, PAP1 mooring from 2002

**Supported by:** United Kingdom

**Operated by:** NOC

**Website:** [projects.noc.ac.uk/pap](http://projects.noc.ac.uk/pap)

**Status:** running (updated May 2020)

**Regional Team Leader:** Sue Hartman, NOC

SCIENCE SERVICE CATEGORY	SCIENCE SERVICE NAME
Access	Access
METEOROLOGICAL PARAMETERS	Meteorological parameters
WATER COLUMN PHYSICS AND BIOGEOCHEMISTRY	Ocean physics and biogeochemistry
MARINE ECOLOGY AND BIODIVERSITY	Ecosystem function: surface to seafloor
	Dynamics of the benthos of the porcupine abyssal plain
ENVIRONMENTAL INDICATORS (MSFD)	Anthropogenic impacts on open ocean systems



# NORWAY

## REPRESENTING ENTITY:

University of Bergen

## REGIONAL FACILITY 1

## NORDIC SEAS

### SCIENTIFIC OBJECTIVES

Better understand the drivers for the temporal and spatial changes of water mass transformations, ocean circulation, acidification, and thermo-chemical exchanges at the seafloor in the Nordic Seas, and contribute to improvement of models and forecasting by collecting and making available high-quality data.

### GENERAL INFORMATION

**Location:** Norwegian Sea, Greenland Sea, Iceland Sea, Fram Strait

**Distance from land:** Distributed, 50– 1000 km

**Max water depth:** 3050 m

**Date 1<sup>st</sup> deployment:** Fall 2020

**Supported by:** Kingdom of Norway

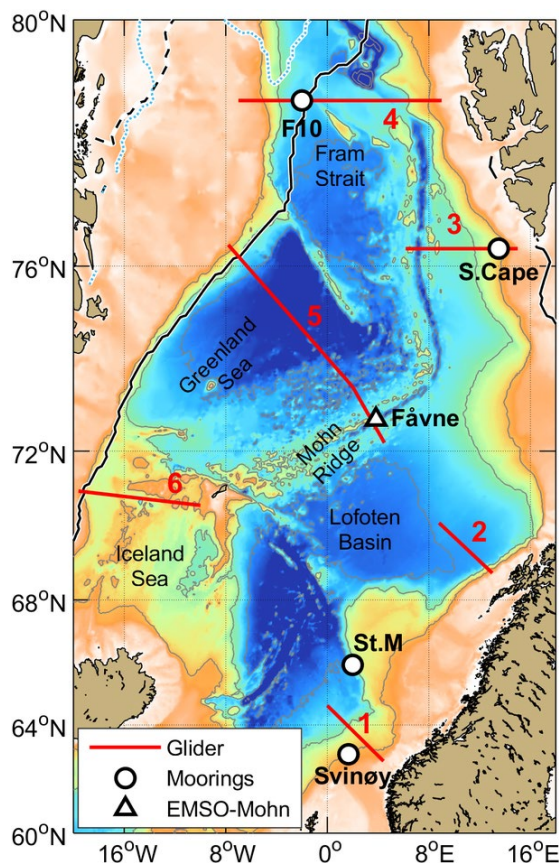
**Operated by:** University of Bergen

**Website:** <https://www.uib.no/en/noremso/>

**Status:** in development (update date – October, 2022)

**Regional Team Leader:** Ilker Fer. University of Bergen

SCIENCE SERVICE CATEGORY	SCIENCE SERVICE NAME
WATER COLUMN PHYSICS AND BIOGEOCHEMISTRY	Svinøy: Hydrodynamic changes in the water column and transport series of the Norwegian Atlantic Current
	South Cape: Methane release variability and transport
	Fram Strait: Hydrographic and current variability in the Arctic water column
	Station M: Hydrography and biogeochemistry time series in the Norwegian Basin
	Gliders: Hydrography and currents along 5 glider sites in the Nordic Seas
	EMSO-Mohn: Hydrothermal plume variability and transport
ENVIRONMENTAL INDICATORS (MSFD)	South Cape: Influence of high methane content in water column geochemistry
	Station M: Anthropogenic impact in the southern Nordic Seas



## SUMMARY

The Nordic Seas regional facility is a distributed infrastructure, member of the EMSO consortium and comprises multiple ocean glider sections, 4 oceanographic mooring sites, and one seabed-water-column-coupled observatory.

Glider transects are in the Norwegian Sea (Svinøy: 62.7°N, 4.4°E - 64.7°N, 0.0°E; Gimsøy: 68.8°N, 13.0°E - 70.2°N, 8.8°E), Fram Strait (78.8°N, 9.0°E - 78.8°N, 7.0°W), the Greenland Sea (73.5°N, 2.0°E - 76.4°N, 7.8°W) and the Iceland Sea (70.6°N, 10.0°W - 71.0°N, 19.6°W). All gliders measure temperature, salinity, pressure, and depth-averaged velocity. Gliders are in operation since 2021.

Moorings sites are Svinøy (63°N 4°E in the southern Norwegian Sea at 500 m water deep; ocean currents, temperature and salinity; running since 2020); Station M (66°N 2°E in the Norwegian Sea at 2050 m depth; temperature, salinity and pCO<sub>2</sub>; running since 2020), South Cape (76.107°N 15.967°E, off South Cape of Svalbard at 390 m isobath near the gas hydrate Pingo; temperature, salinity, pH, CH<sub>4</sub> and CO<sub>2</sub> sensors; in development), and the central Fram Strait (78.83°N 2°W in Fram Strait at 2655 m isobath; ocean currents, temperature, salinity, dissolved oxygen, pH and pCO<sub>2</sub>; running since 2020).

The fixed-point seabed-water-column-coupled and wireless observatory is at the Mohn Ridge (72.756°N 3.834°E, Fåvne vent field at 3050 m water depth; in development). The observatory will be composed of one deep-ocean water-column mooring coupled with a seafloor node, and of a transmission buoy that communicates acoustically with the seafloor station and relays data (pressure, temperature, turbidity, currents) via satellite.

**EMSO scientific disciplines:** geosciences, physical oceanography, biogeochemistry, marine ecology (planned).

# EMSO ERIC

## Annex 3

### List of publications

Abstracts congress, scientific articles and events

## CONFERENCES | EVENTS

Fer, "NorEMSO -The Norwegian node for the European Multidisciplinary Seafloor and water column Observatory", Annual meeting of the program Ocean Acidification of Norwegian Waters (funded by the Norwegian Environment Agency), February 15, digital, [www.miljodirektoratet.no/publikasjoner/2021/mai-2021/monitoring-ocean-acidification-in-norwegian-seas-in-2020/](http://www.miljodirektoratet.no/publikasjoner/2021/mai-2021/monitoring-ocean-acidification-in-norwegian-seas-in-2020/)

S. Martini, C. Tamburini, C. Gojak, J. Aguzzi, A. Arnaubec, L. Barnes-Davin, K. Bernardet, V. Bertin, O. Bocquet, B. Bombled, P. Chevaldonne, P. Coyle, V. Ciausiu, P. Cuny, X. Durrieu De Madron, M. Garel, L. Le direach, E. Rouanet, C. Grenz, Z. Hafidi, P. Lamare, C. Laus, D. Lefevre, N. Le Bris, K. Mahiouz, S. Marini, M. Matabos, C. Militon, D. Nerini, T. Perez, L. Picheral, M. Picheral, R. Piasco, C. Rabouille, J. Sarrazin, D. Thibault and L. Thomsen, "BathyBot – a Deep-sea Crawler to See the Unseen in the NW Mediterranean Sea", Deep Sea Biology Symposium (<https://wwwz.ifremer.fr/16dsbs/>), Brest France, 12-17 September 2021

Fer, "NorEMSO – Glider activity", ONR-Global Arctic Portfolio Seminar Series: Oceanography [www.onr.navy.mil/en/Science-Technology/Departments/Code-32/all-programs/arctic-global-prediction](http://www.onr.navy.mil/en/Science-Technology/Departments/Code-32/all-programs/arctic-global-prediction), May 11, digital

J. Dañobeitia, P. Favalì, L. Beranzoli, A. Berry, J. Blandin, M. Cannat, M. Carapuço, A. Castro, L. Coppola, E. Delory, J. del Rio Fernandez, D. Embriaco, I. Fer, B., Ferré, M. I. Fredella, A. Gates, A. Giuntini, S. Hartman, N. Lantéri, G. Marinaro, P. Materia, G. Petihakis, V. Redulescu, I. Rodero, PM Sarradin, Z. Stroynowski, "EMSO ERIC, the pan-European infrastructure of seafloor and water column observatories around European Seas, extends its coverage to the Arctic.", 9th EuroGOOS International Conference, Conference Paper Ifremer, EuroGOOS AISBL, May 2021, Brest, France, [https://hal.archives-ouvertes.fr/EUROGOOS2021\\_CONFERENCE/hal-03336356](https://hal.archives-ouvertes.fr/EUROGOOS2021_CONFERENCE/hal-03336356)

P. Gaughan, G. Nolan, C. Cusak, R. Thomas, A. Berry et al., "Stronger Together: Developing the framework for a sustainable National Research Infrastructure EirOOS (Irish Ocean Observing System) as an effective component of the European Ocean Observing System (EOOS)", 9th EuroGOOS International Conference, Shom, Ifremer,

EuroGOOS AISBL, May 2021, Brest, France, (Virtual) [https://hal.archives-ouvertes.fr/EUROGOOS2021\\_CONFERENCE/hal-03330363](https://hal.archives-ouvertes.fr/EUROGOOS2021_CONFERENCE/hal-03330363)

E. Delory, S. Marini, J. Blandin, C. Boccadoro, D. Durand, et al., **"Jerico-S3 Integrated Innovative Technologies for Coastal Monitoring"**, 9th EuroGOOS International conference, Shom, Ifremer, EuroGOOS AISBL, May 2021, Brest, France. pp.186-192. <https://hal.archives-ouvertes.fr/hal-03334236v2>

A. Gates, **"Understanding multi-decadal change in the deep ocean: atmosphere to seafloor at the Porcupine Abyssal Plain Sustained Observatory, NE Atlantic"** 16th Deep-Sea Biology Symposium, Brest, France, 12-17 September 2021 <https://www.ifremer.fr/16dsbs/>

N. Lo Bue, R. Sanders, A. Stanica, **"Synergies and cooperation among marine RIs"**, Euro ARGO RISE - Mediterranean and Black Seas workshop 8-9 April 2021, [www.euro-argo.eu/News-Meetings/Meetings/Others/Mediterranean-and-Black-Seas-workshop](http://www.euro-argo.eu/News-Meetings/Meetings/Others/Mediterranean-and-Black-Seas-workshop)

G. Marinaro, J. Balmer, J. O'Neill, D. Embriaco, F. Simeone, B. M. Howe, **"Wet demo SMART cable at Western Ionian Sea"**, 37th General Assembly of the European Seismological Commission ESC - S35: Tsunamis in Europe and worldwide: Observations, theory and numerical analyses for hazard and risk assessment and risk reduction, 2021, 19-24 September 2021, <https://www.erasmus.gr/microsites/1193/final-detailed-programme>

S.Viola and F. Simeone, **"Training 5- Methods for the detection and analyses of anthropogenic sound in the oceans"**, EMSO Time Series Conference "Observing Ocean Sound", 20-22 October 2021 (<https://tsc2021.emso.eu/>) Gran Canaria, Canary Islands, Spain

Chair: P. Gaughan, Keynote speakers: J. J. Dañobeitia, N.C. CHU, H. Leau, **"One Ocean Network for Deep Observation"**, a United Nations "Ocean Decade" endorsed action, EMSO Time Series Conference 2021 "Observing Ocean Sound", 20-22 October 2021 (<https://tsc2021.emso.eu/>) Gran Canaria, Canary Islands, Spain

F. Paladini de Mendoza, K. Shroeder, J. Chiggiato, S. Miserocchi, L. Langone, P. Giordano, **"Acoustic measurements applied to geophysical processes during dense water cascading events in the Southern Adriatic basin (Italy)"**, EMSO Time Series Conference 2021 "Observing Ocean Sound", 20-22 October 2021 (<https://tsc2021.emso.eu/>) Gran Canaria, Canary Islands, Spain

S. Neves, A. Castro, E. Delory, C. Barrera, J. De La Fuente, M. Arbelo, & A. Fernandez, **"The use of autonomous vehicles in the sustainable management of commercial whale watching activity – MARCET Project"**, EMSO Time Series Conference "Observing Ocean Sound", 20-22 October 2021 (<https://tsc2021.emso.eu/>), Gran Canaria, Canary Islands, Spain.

J.A.Díaz,, & E. Delory, E. **"Development of a virtual research environment for noise map visualization and data processing in the North-East Atlantic region."** EMSO Time Series Conference "Observing Ocean Sound", 20-22 October 2021 (<https://tsc2021.emso.eu/>), Gran Canaria, Canary Islands, Spain.

M. Cubas-Armas, A. Hernandez-Guerra, E. Delory, D. Dellong, & J.A. Díaz, **"Modelling the underwater noise of wind farms in the south-east of Gran Canaria."** EMSO Time Series Conference "Observing Ocean Sound", 20-22 October 2021 <https://tsc2021.emso.eu/>, Gran Canaria, Canary Islands, Spain.

Martinez, E., Toma, D.M., Del Rio, J., **"Handling marine sensor heterogeneity using open standards and services"**, VI Expanding Ocean Frontiers Conference. 5th - 7th July 2021. BCN, Virtual format <https://eof2020.es/>

Carandell M., Toma D.M., Gasulla M., Del Rio J., **"Contributions to the pendulum-type wave energy converter system for oceanic drifter applications"**, VI Expanding Ocean Frontiers Conference. 5th - 7th July 2021. BCN, Virtual format <https://eof2020.es/>.

Martí V., Toma D.M., Cadena-Muñoz F.J., Gomariz S., de Pablo J., Cortina J., Gibert O., Florido A., Auge X., Valderrama C., **"On-line measurement of water quality at Besos estuary: effects of storm and heavy rain episodes"**, 9th International Workshop on Marine Technology. 16-17 June 2021. Vigo, Virtual format. <https://sarti.webs.upc.edu/martech/>.

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Toma D.M., Artero C., Martinez E., Cadena-Muñoz F.J., Nogueras M., Carandell M., Del Rio J., Gomariz S. **"An integrated biogeochemistry observation system at Besòs estuary"**, 9th International Workshop on Marine Technology. 16-17 June 2021. Vigo, Virtual format. <https://sarti.webs.upc.edu/martech/>

Masmitja I., Gomariz S., Bouvet P., Aguzzi J., Del Rio J., **"Developing an acoustic tag with bidirectional communications capabilities"**, 9th International Workshop on Marine Technology. 16-17 June 2021. Vigo, Virtual format. <https://sarti.webs.upc.edu/martech/>

Nogueras M., Del Rio J. **"Underwater light estimation using the OBSEA camera"**, 9th International Workshop on Marine Technology. 16-17 June 2021. Vigo, Virtual format. <https://sarti.webs.upc.edu/martech/>

Ortiz J., Carandell M., Barjau A., **"Dynamic analysis of a pendulum-type wave energy converter for oceanic drifters by means of a 4 DoF model"**, 9th International Workshop on Marine Technology. 16-17 June 2021. Vigo, Virtual format. <https://sarti.webs.upc.edu/martech/>

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Masmitja I., Corregidor D., López J., Martínez E., Navarro J., Gomariz S. "Miniaturised bidirectional acoustic tag to enhance marine animal tracking studies". IEEE International Instrumentation and Measurement Technology Conference. 17-20 May 2021. Canada and Virtual format. <https://i2mtc2021.ieee-ims.org/>

Pedreira F., Andrade J., Matos J., Martínez E., Rojas J., Gonçalves P., Lucas M., Esteves R., Del Rio J., Chumbinho R. "MELOA Catalogue and GeoPortal: A modern approach for open access and visualization of in situ drifter data", 9th EuroGOOS International Conference: Advances in operational oceanography. 3-5 May 2021. Virtual format.

Martínez E., Toma D.M., Novellino A., Alba M., Del Rio J., "In-situ real-time underwater noise dataflow: from OBSEA to EMODnet", IMDIS 21 - International Conference on Marine Data Information Systems 2021. 12-14 April 2021.

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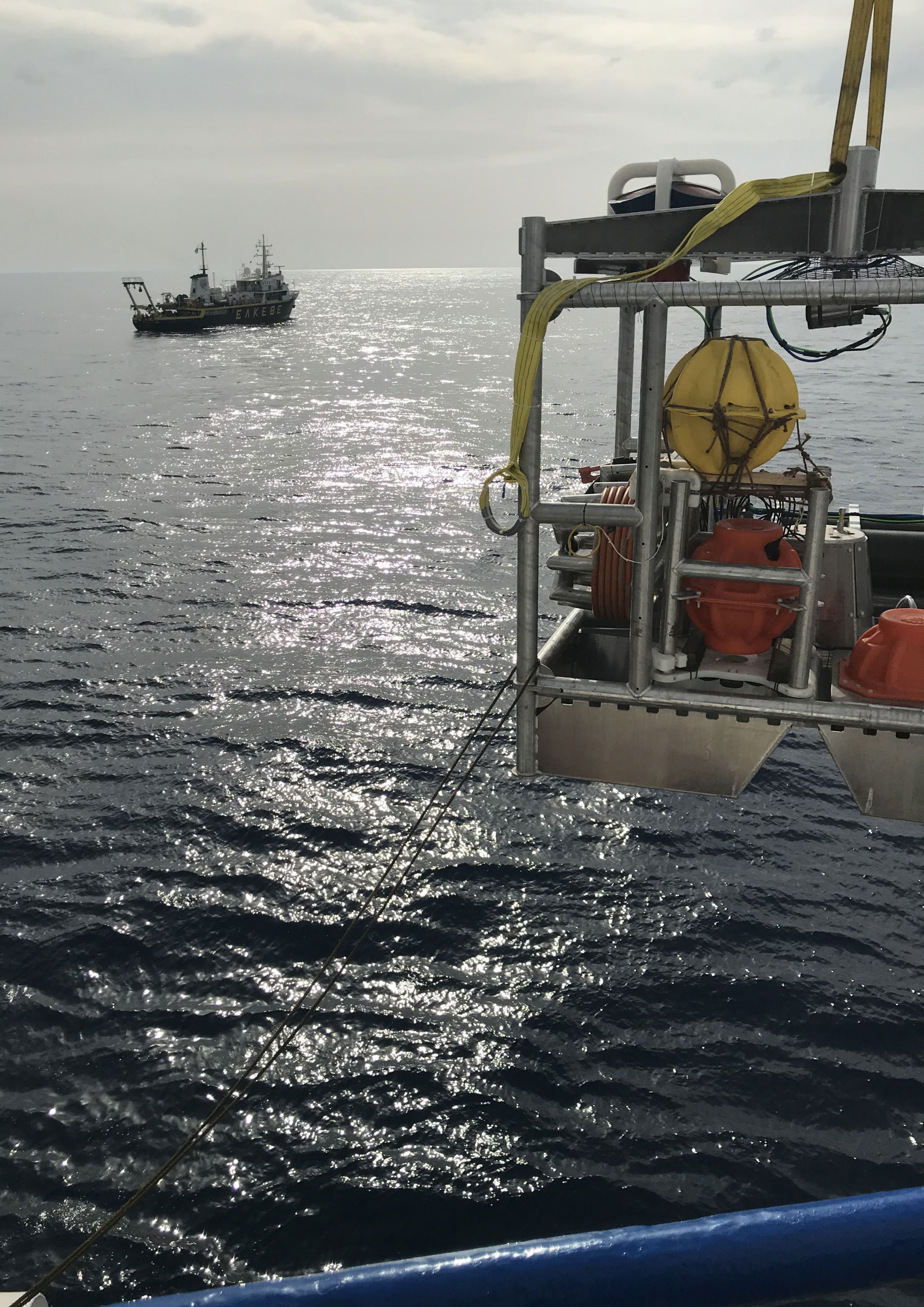
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# EMSO ERIC

## Annex 4

### List of the projects in which EMSO is involved

ACRONYM	PROJECT OBJECTIVE	EMSO ROLE
<b>AtlantECO</b>	The overall objective of AtlantECO is to determine the structure and function of Atlantic microbiome in the context of ocean circulation and presence of pollutants, e.g. plastics, to assess: 1. its role in driving the dynamics of Atlantic ecosystems at basin and regional scales; 2. its potential of being used as a sensor of ecosystem state; 3. the mechanisms by which it drives the provision of ES.	Generate new observations about microbiomes, plastics and the plastisphere, using AtlantECO's standard protocols during sampling activities in the Atlantic (ESTOC). Start date: 01/09/20; End date: 31/08/24
<b>DOORS</b>	It will harmonise research and provide the infrastructure to better understand the Black Sea, particular ecosystem characteristics, develop the framework to support Blue Growth and early development of startups, and provide evidence to inform policy and behavioural change.	Stakeholder Engagement and Project Legacy , EGANGING THE PUBLIC AND THE MEDIA, SUPPORTING CITIZENS SCIENCES, Design the SoS through Stakeholder and End-User Engagement within the Black Sea Riparian Countries, Connection to existing sensor networks and digital data sets. Support the harmonisation processes for existing data, Review existing methodologies and propose harmonised options. Start date: 01/06/21; End date: 31/05/25
<b>EGI-ACE</b>	EGI-ACE Overall Objective Implement the Compute Platform of the European Open Science Cloud and contribute to the EOSC Data Commons by delivering integrated computing, platforms, data spaces and tools as an integrated solution that is aligned with major European cloud federation projects and HPC initiatives.	WP5 - Federated data spaces (VA) EMSO ERIC data services Installation: EMSO ERIC data services provide access to harmonized key ocean variables from 11 observatory nodes placed at key environmental sites across European seas, from the North Atlantic, through the Mediterranean, to the Black Sea. The EMSO ERIC data services are currently operated using EGI resources. The services include databases of harmonized EMSO ERIC data and metadata, data portal and dashboards supporting science-driven use case applications, machine-to-machine interfaces, data archive, DAP services, and virtual research environments. Start date 01/01/21; End date 30/06/23

## EMSO ERIC Annex 4 List List of the projects in which EMSO is involved

<b>ENRIITC</b>	The ENRIITC proposal has four key objectives, which are specifically designed to allow the consortium and its Associates to achieve their overall goal, that is to enhance collaboration between RIs and industry in Europe.	EMSO involved in WP2 for mapping the key element to enact the envisaged collaborative framework between the ESFRI RIs and industry players to bring technological innovation about. In WP3, Development of strategy and best practices for exploiting the innovation potential of RIs and : Development of strategy for the training of ILOs/ICOs. Start date 01/01/20; End date 31/12/22
<b>ENVRI FAIR</b>	ENVRI-FAIR is the connection of the ESFRI Cluster of Environmental Research Infrastructures (ENVRI) to the European Open Science Cloud (EOSC). The overarching goal is that at the end of the proposed project, all participating RIs have built a set of FAIR data services which enhances the efficiency and productivity of researchers, supports innovation, enables data- and knowledge-based decisions and connects the ENVRI Cluster to the EOSC.	Part of The Board of European Environmental Research Infrastructure (BEERi) - Fostering ENVRI data-driven innovation - support to Common FAIR Policies - EMSO FAIR data implementation - Implementation of FAIR roadmap for Marine solid Earth data.F23 Start date 01/01/19; End date 30/06/23
<b>EOSC Future</b>	EOSC Future responds to INFRAEOSC-03-2020 call in order to integrate, consolidate, and connect e-infrastructures, research communities, and initiatives in Open Science to further develop the EOSC Portal, EOSC-Core and EOSCExchange of the European Open Science Cloud (EOSC).	EMSO ERIC will provide information on EOVs affecting the distribution and behavior of different invasive species in European seas. EMSO ERIC will cover the following tasks: a) Provision of data obtained through different Regional Facilities, and b) eventual access to a selected number of Regional Facilities. Start date 01/12/21; End date 30/09/23
<b>ERIC FORUM</b>	The ERIC Forum Implementation Project is a Horizon2020 project which brings together the ERIC community to strengthen its coordination and enhance its collaborations. The strategic approach of the ERIC Forum will contribute to address critical challenges and develop best practices.	Budgeting and financial reporting principles. Start date 01/01/19; End date 31/12/22
<b>eRImote</b>	The eRImote project is the first to consider solutions for digital and remote service provision across RI domains and to look for transferable practices and new developments that will improve accessibility and resilience of RI infrastructures. While existing processes will be collected, eRImote will also explore new solutions using defined use cases to develop and test their implementation in RI scenarios. This will take us beyond the state-of-the-art for concrete solutions and motivate further development of use cases which this project lacks the scope or resources to implement.	Remote access USE CASE Elaboration of recommendations as part of a green paper for the development of remote and digital access policies in the framework of RI providing information to promote the integration with partner infrastructure organizations (e.g. EOSC through the EOSC Association). Start date 01/06/22; End date 30/11/24
<b>EUROFLEET+</b>	EurofleetsPlus will facilitate open access to an integrated and advanced research vessel fleet, designed to meet the evolving and challenging needs of the user community. European and international researchers from academia and industry will be able to apply for several access programmes, through a single-entry system. EurofleetsPlus will prioritise support for research on sustainable, clean and healthy oceans, linking with existing ocean observation infrastructures, and support innovation through working closely with industry.	Stakeholders engagement. Start date 01/01/19; End date 31/10/23



<b>EUROSEA</b>	<p>EuroSea will increase the technology readiness levels (TRL) of critical components of ocean observations systems and tools, and in particular the TRL of the integrated ocean observing system.</p>	<p>We aim to improve harmonization between the EMOSO-E-ERIC and the global Eulerian observatory network (OceanSITES) in order to create a coherently coordinated European network of Eulerian Observations. Harmonization of metadata standards, Best Practices, and data quality control and archiving will be done and the network will be further opened to new users and contributors (e.g. T3.8). Support for WP6,7 will be provided by the implementation of paired pH/O2 sensors.</p> <p>Start date 01/11/19; End date 31/10/23</p>
<b>iImagine</b>	<p>iImagine provides a portfolio of 'free at point of use' image datasets, high-performance image analysis tools empowered with Artificial Intelligence (AI), and Best Practice documents for scientific image analysis. These services and materials enable better and more efficient processing and analysis of imaging data in marine and freshwater research, accelerating our scientific insights about processes and measures relevant for healthy oceans, seas, coastal and inland waters.</p>	<p>Marine ecosystem monitoring.</p> <ul style="list-style-type: none"> <li>• Improves and simplifies data flows to databases by providing guidelines and standards for multidisciplinary data management</li> <li>• Improves the pre-processing pipeline and methods for automatically processing video imagery for identifying interesting images for further analyses for purposes of ecosystem monitoring at EMSO sites, dealing with large volume and continuous video and further automation, in order to generate multidisciplinary databases.</li> </ul> <p>Start date: 01/09/22; End date: 31/08/25</p>
<b>Geo-INQUIRE</b>	<p>Geo-INQUIRE will provide and enhance access to selected key data, products, and services, enabling the dynamic processes within the geosphere to be monitored and modelled at new levels of spatial and temporal detail and precision. Geo-INQUIRE aims to overcome cross-domain barriers, especially the land-sea-atmosphere environments, and will exploit innovative data management techniques, modelling and simulations methods, developments in AI and big data, and extend existing data infrastructures to disseminate these resources to the wider scientific community, including the EOSC landscape.</p>	<p>Participates to WP2 (access to sea floor data), WP6 (RIs integration) and WP9 (training). Leads one task in WP7 (Fair metrics evaluation); participates to WP6 coordination task.</p> <p>Start date: 01/10/22; End date: 30/09/26</p>
<b>MINKE</b>	<p>MINKE will integrate key European marine metrology research infrastructures, to coordinate their use and development and propose an innovative framework of "quality of oceanographic data" for the different European actors in charge of monitoring and managing the marine ecosystems. MINKE proposes a new vision in the design of marine monitoring networks considering two dimensions of data quality, accuracy and completeness, as the driving components of the quality in data acquisition.</p>	<p>Harmonisation of Data - Networking and Engagement with Stakeholders.</p> <p>Start date: 01/04/21; End date: 31/03/25</p>





