

Agenda Item	Preparatory document for Session Technology Strategy on 12 March 2025
Purpose	This cover document introduces the above referred session of the EMSO strategic workshop with a summary of the EMSO achievements so far, the strategic options the EMSO community shall think about and the questions asked to the EMSO community.
Reference documents if any, (can be in annex, URL or else)	<ul style="list-style-type: none"> -Preliminary Inventory (annexed) -The EMSO Generic Instrument Module (EGIM): Standardized and Interoperable Instrumentation for Ocean Observation (https://www.frontiersin.org/journals/marine-science/articles/10.3389/fmars.2022.801033/full) -Physical Access Service website (https://emso.eu/physical-access/) -ADCP best practices abstract (annexed) -EMSO Western Ionian Sea Wet Demo (https://emso.eu/2024/12/17/worlds-first-smart-cable-data-release-at-emso-western-ionician-sea/) -Resident AUVs abstract (annexed) -Gliders Working Group report 2023 (annexed)
Expected outcomes	The expected outcome from this session is to obtain feedback from the different actors of the EMSO community and from the Industry on key questions addressing the further development of the Engineering and Logistics in EMSO. The main activities and discussions that have been taking place during the last years will be presented and feedback will be requested to help further prioritize actions of the ELSG group.
Version date and lead person.	<p>V0 - 26/02/2025 S. Cusi (first version)</p> <p>V1 - 06/03/2025 S. Cusi (after comments)</p>

Background Considerations (1/2page max, ideally no more than 10 lines)

The Engineering and Logistics Service Group (ELSG) is formed by one member of each regional facility. These members usually have an active role in running the operational part of the Regional Facility and also participate in projects where new technology is developed or introduced in their laboratories or ocean sites. The ELSG meets every two months approximately to discuss topics regarding technology. Aside from this general meeting, other meetings take place among specialized groups (Working Groups, WGs) formed by ELSG members or other members of the Regional Facilities. The ELSG counts with 3 active WGs (EGIM-EMSO Generic Instrument Module, ADCP-Acoustic Doppler Current Profiler, Cabled Observatories) and the

idea is to have one for each platform and instrument technology (O₂ sensors, CTD, pressure sensors, surface buoys, resident AUVs, etc).

Summary of key achievements

Last year a process to **inventory** the different platforms, instruments/sensors and activity of the facilities was started. Although an inventory had been performed before, the new idea is to make it live so that at any moment we can see what platforms and instruments are deployed at sea, where they are deployed, what depth, what is their operational status, and also what added services they provide (i.e real time data, physical access, etc). The EMSO infrastructure is the base for numerous services and a web platform to manage the inventory connected to the services (data, access, training, etc) would be of great use.

In terms of technology, one key success story of EMSO is the **EGIM (EMSO Generic Instrument Module)**. The idea of the EGIM is to have a standard platform with a standard set of sensors (Turbidimeter, CTD, Currentimeter, Hydrophone, Oxygen Optode, Tsunami meter) that provide a set of variables across the different EMSO sites. The EGIM would be a powerful data harmonizer in a consortium that is very multidisciplinary and heterogeneous. The EGIM was developed during the EMSODEV project between 2015 and 2018 and currently 6 units have been built. After the project ended, the EGIM was licensed to RTSYS until 2023. Currently the existing EGIMs are used regularly in 2 Regional Facilities and also in some EU funded projects (GEORGE, TRIDENT), where some technological improvements are done. Now the EGIM needs a redesign to be more affordable, open and spread across the EMSO facilities and beyond.

One of the services provided by the ELSG is the **Physical Access**. The first call for access was launched in April 2022 and it has been permanently open since then. EMSO offers grants to successful applications of up to 15k€ for travel, consumables, shipping, operations, adaptations and calibrations needed to run the experiment. Users can be public and private with no restrictions regarding country of origin. Evaluations have cut-offs every 2 months so that the availability of the service is constant. Evaluation has bonus points for linking the project with the industry, making the call very suitable for SMEs and industry in general. Up to today 10 projects have been granted with an investment in grants of 95k€ and of 900k€ in Access Units. Three of these projects have been granted to the private sector as main user. Two other projects bring the private sector as partners to the main user, a research institution. Therefore, the users being 70% public and 30% private. This program is the foundation for new collaborations and provides EMSO with new partners and ideas to further develop its services and technologies. The access policy document is about to be finalized, which will give this service a better support and stability. In the near future a web platform to manage the process, from application to final reporting should be considered.

According to the provisional inventory, the **ADCP** is the second most used instrument by EMSO Regional Facilities. Data quality provided by instruments deployed at sea is highly dependent on how the instruments are operated and maintained. To improve the current data quality and set

up an example for other instruments and platforms to follow, the ADCP WG was created. The group counts 5 members (not all from the ELSG) and one acts as a chair. The ELSG Leader and the ELSG Officer also participate. The group has been working on a document to define best practices and guidelines that could be followed by the EMSO community. This work has been strongly enhanced by a TNA access project the group put together for the MINKE TNA call. This allowed the members of the group to meet in person at the SHOM facilities, where the ADCP calibration and maintenance techniques have been developed for a long time. This provided the ADCP WG members with a deep understanding of the ADCP functioning and its potential issues. The group will write a paper for the next OCEANS '25 conference in Brest (abstract already accepted) and also a document for the EMSO community on best practices for ADCP operation. It is to be decided if the group needs to go further and provide a concrete checklist that could be adopted by the Regional Facilities to obtain the EMSO label.

Recently a **WG on cabled observatories** has also been created to respond to the demand for technical advice on the SMART cable initiatives EMSO is getting involved in. EMSO Western Ionian Regional Facility is pioneering this technology with a SMART cable demo deployment, the first in the world. This demo deployment counts with 3 nodes and is already providing real time data of the seafloor off Sicily. The WG will also work to better understand and develop Distributed Acoustic Sensing (DAS) technologies, leveraging the experience and cables of five EMSO Regional Facilities. The group will also deal with the cabled seafloor observatories and their technological challenges.

Finally, the ELSG group needs to look to the future in which **more autonomy and a larger footprint** of the observations are requested, moving from the fixed point to the fixed region coverage. For that reason the possibility to include **mobile autonomous systems** into the EMSO infrastructure is being evaluated. In 2023 it was already pondered the inclusion of ocean gliders, since already more than half of the EMSO Regional Facilities were operating them. **Gliders** could provide a picture of the surroundings of an observatory or could link different observatories giving information on mesoscale processes (0~100km). They could also relay small amounts of pre-processed data collected from standalone subsurface moorings or seabed platforms, providing vital information on the performance of these isolated systems. Closer to the moorings and seabed stations, **Autonomous Underwater Vehicles (AUVs)** could perform submesoscale studies (0~10km), benthic surveys, and other tasks requiring more precise positioning and power hungry sensors. The AUVs could be stationed at the moorings or seabed stations (resident AUV), charge their batteries and download the data. This scenario, technically complex, would reduce human intervention, ship time and would increase the monitoring footprint and reduce the carbon footprint.

Points of attentions and asked questions to the attendees

The achievements above open the door to new questions on the future of the technological side of EMSO.

A] The **inventory** is a great tool to show in real time the EMSO monitoring capability and can be also used by other EMSO services. It can help identify infrastructure and monitoring gaps. The

Regional Facilities could update in real time the inventory and the deployment status; access services such as virtual or physical access could pull information from the database and use the real time information to improve and make the service more dynamic.

1. Should the inventory and deployment information feed a main database from which virtual (data) and physical access services will get information?

B] The **EGIM** has the potential to help homogenize the measurements across the different regions, helping tackle key scientific questions that need global monitoring.

1. Should EMSO keep betting on the EGIM as a standardization element?
2. Should an 'EGIM service' be created so that EMSO engineers could maintain, evolve and deploy EGIMs on demand?

C] The **physical access** service is a great tool to bring new ideas and collaborations for the EMSO Regional Facilities. They bring new ideas, contacts, technologies, datasets and ask for the facilities to be up to date in the technological aspect.

1. Should the physical access service be oriented toward the industry or more towards academics? or both but with different assessment procedures and resources allocation?

D] The **ADCP WG** has completed a cycle and will soon deliver a best practice document for the EMSO community.

1. What is the next step of such a WG? Should the WG be closed or should it carry on in the shape of a service that would keep EMSO in touch with manufacturers, keep improving best practices and be a technical support for the EMSO community.
2. Should EMSO try to bring calibration facilities in the consortium and provide calibration services or should it outsource them? Maybe a mix of both?
3. Should the best practices be enforced (and metadata confirming they were applied in the datasets) if a Regional Facility wants the EMSO Label?

E] The **SMART cables** can greatly increase EMSO's monitoring coverage.

1. What should the ELSG role be in the design/deployment/maintenance of such infrastructure?
2. How far the role to play should stand in the ELSG rather than in the DMSG (Data Management Service Group)?

F] About **AUVs, Gliders and MAS**. The future of ocean monitoring will have a very important autonomy component to increase the coverage and reduce the carbon footprint. Autonomous Underwater Vehicles are already operational and available, although for now still expensive and needing very specialized personnel.

1. Are resident AUVs a feasible solution to increase the EMSO sites autonomy and monitoring capability?
2. Should EMSO have a glider service to optimize the use of such vehicles in the EMSO regions on purpose? This service could be internal (federating the existing partners' capacities or based on a procurement with external operators)

Annexes