



EMODnet



European Marine
Observation and
Data Network

EMODnet Open Sea Lab 4.0 Hackathon

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EMODnet Open Sea Lab 4.0 Short report [D1.4]

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1 EMODnet Open Sea Lab: Background

The European Marine Observation and Data Network (EMODnet) is an EU public marine data initiative managed by the Directorate-General Maritime Affairs and Fisheries (DG MARE) of the European Commission. It acts as a European hub and a trusted source for *in situ* marine data and related data products, crucial for numerous marine and maritime sectors across Europe. EMODnet's delivery is a collective endeavour, involving over 130 European organisations and an expanding network of public and private partners dedicated to enhancing marine data accessibility and usability.

As part of its mission to promote open marine data usage, EMODnet organises the Open Sea Lab (OSL) hackathon series. OSL events uniquely engage the marine data community through their distinct blend of openness, creativity, and enthusiasm. Each hackathon serves as a dynamic platform for participants to develop innovative solutions, learn new skills, share knowledge, and network within an inspiring open data environment.

The Open Sea Lab concept emerged from the EMODnet Open Conference in 2015, driven by the ambition to raise awareness and increase the uptake of EMODnet data and services across diverse user communities. Unlike traditional hackathons, OSL provides participants with an immersive exploration into marine open data, focusing closely on user needs and acting as real-time 'stress-tests' for EMODnet's data offerings. Expert mentors from marine data science and entrepreneurship guide participants in creating practical, user-driven applications. Importantly, the OSL series aims to diversify EMODnet's user base, demonstrate impactful societal applications of marine data, and gather essential feedback to continually enhance EMODnet's services and functionalities.

Following the success of previous editions (2017, 2019, and 2023), Open Sea Lab 4.0 continues this innovative trajectory. Kicked off in Spring 2025, OSL 4.0 embraced a hybrid format combining virtual and physical participation, enabling broader global engagement while fostering direct interactions among participants, mentors, and experts. Building upon the momentum from the previous fully virtual event, which saw unprecedented international participation and innovation, OSL 4.0 was positioned to further expand EMODnet's community, promoting even greater diversity, collaboration, and the continued evolution of marine open data applications.

1.1 Evolution of the EMODnet Open Sea Lab

Open Sea Lab I - The inaugural edition of Open Sea Lab took place in Antwerp, Belgium, in November 2017. It was collaboratively organised by the EMODnet Secretariat, Flanders Marine Institute (VLIZ), and Interuniversity Microelectronics Centre (IMEC), with valuable support from the European Commission's DG MARE. Gathering participants from 15 European nations with varied backgrounds and expertise, this three-day event was held in the dynamic environment of Antwerp's StartUp Village. Participants engaged in intensive expert-led workshops, receiving specialised training in data manipulation, business modelling, user-testing, and presentation skills. Further details about the first Open Sea Lab are available on the dedicated OSL webpage on the EMODnet website¹.

Open Sea Lab II - Building on the momentum of its predecessor, Open Sea Lab II was hosted in Ghent, Belgium, in 2019, welcoming 70 participants from 19 countries. This second edition expanded

¹ <https://emodnet.ec.europa.eu/en/missed-open-sea-lab-watch-film>

collaboration to include Copernicus Marine Service and the International Council for the Exploration of the Sea (ICES), alongside existing partnerships with the EMODnet Secretariat, VLIZ, and IMEC. DG MARE continued its integral support for this initiative, which further strengthened the community and fostered novel applications of marine data. More insights and outcomes from Open Sea Lab II can be explored on its dedicated EMODnet webpage².

Open Sea Lab III - The third edition, Open Sea Lab 3.0 (OSL 3.0), marked a significant milestone, adopting a fully virtual format in early 2023. This edition coincided with the launch of EMODnet's centralised services, providing participants with an opportunity to engage with a new unified cross-thematic map viewer featuring enhanced functionalities. Set against a backdrop of evolving European and international marine policies, OSL 3.0 aligned closely with key initiatives including the EU Green Deal and the EU Digital Twin of the Ocean (EDITO), to which EMODnet contributes substantially alongside Copernicus Marine Service. Additionally, it supported the objectives of the EU Mission: Restore our Ocean and Waters by 2030 and the UN Decade of Ocean Science for Sustainable Development. OSL 3.0 was dedicated to community-building, fostering innovation, and encouraging the development of practical, science-based applications leveraging EMODnet's data resources. Check out the event's dedicated webpage for more information.

2 EMODnet Open Sea Lab 4.0: Harnessing the Power of EMODnet for EDITO

The fourth edition of EMODnet's hackathon, Open Sea Lab 4.0 (OSL 4.0), took place virtually from 25-27 March 2025. This event brought together data scientists, software developers, social innovators, and changemakers from across Europe and beyond to tackle pressing ocean challenges (see information on this year's five challenges below). Participants utilised EMODnet's *in situ* marine data and Copernicus Marine Service remote sensing data on the European Digital Twin Ocean (EDITO) platform to develop innovative solutions supporting the EU Green Deal, the EU Mission: Restore Our Ocean and Waters, and the UN Sustainable Development Goals (SDGs).

OSL 4.0 emphasised EMODnet's integral role in the European Digital Twin Ocean (DTO) and EDITO infrastructure, focusing on integrating cross-thematic data and conducting analyses directly within the EDITO environment. Participants were encouraged to incorporate complementary datasets, including those from Copernicus Marine Service and other sources optimised for the EDITO platform. By combining EMODnet's data with the DTO's powerful capabilities, OSL 4.0 aimed to drive impactful applications and advancements in marine sustainability and innovation. There were 401 registrations to OSL 4.0, with 24 teams selected to work on the hackathon's five key challenges.

² <https://emodnet.ec.europa.eu/en/open-sea-lab>



Figure 1. OSL 4.0 logo

2.1 Open Sea Lab 4.0 Challenges

The hackathon presented five challenges, inviting participants to utilise marine data through the EDITO platform and EMODnet to develop innovative, impactful solutions:

Challenge 1: EMODnet Supporting the Blue Economy Green Transition

How might EMODnet data support the transition of the blue economy towards sustainability and regeneration, promoting environmentally friendly practices and competitive innovation? Participants were encouraged to harness a wide range of EMODnet's marine data to propose solutions that actively contribute to a greener maritime economy, including aquaculture, fisheries, offshore renewable energy, coastal tourism, ports, marinas, boating, shipping, dredging and more.

Challenge 2: EMODnet for a Healthy and Productive Marine Environment

How can EMODnet's *in situ* data and data products contribute to improved environmental management and enhanced understanding of marine ecosystems? Participants were tasked with using EMODnet's comprehensive datasets to support evidence-based policymaking, particularly contributing to EU frameworks such as the Marine Strategy Framework Directive (MSFD) and Birds and Habitats Directive (BHD).

Challenge 3: EMODnet for Managing the Use of our Seas and Ocean

How could EMODnet data be leveraged to support climate-smart maritime spatial planning (MSP), facilitating sustainable management and balanced use of marine resources? Participants were invited to explore the potential of EMODnet's diverse marine datasets to develop adaptive spatial planning tools that effectively address ecological, economic, and societal considerations.

Challenge 4: EMODnet for the Coast

In what ways can EMODnet’s *in situ* data and derived data products assist in monitoring coastal zones, understanding coastal ecosystem health, and supporting climate adaptation strategies? Participants were challenged to create applications and visualisation tools that clearly communicate the state of coastal areas and ecosystems, helping stakeholders adapt and mitigate impacts.

Challenge 5: WILD CARD: Hack the Ocean with EDITO (Open Challenge)

How might EMODnet and Copernicus data be creatively combined on the EDITO platform to tackle emergent ocean challenges? Participants were given the freedom to integrate EMODnet’s marine data with satellite observations, climate models, and other open datasets, encouraging bold, innovative ideas addressing unique or cross-cutting marine sustainability issues.

The figure displays five challenge cards arranged in two rows. The top row contains three cards, and the bottom row contains two cards. Each card has a distinct background color and a representative image at the top. The text on each card describes the challenge's focus and provides a link for more information.

- Challenge One:** Features a wind turbine image. Title: "EMODnet Supporting the Blue Economy Green Transition". Description: "How can EMODnet be used to produce marine knowledge, tools and applications that advance the green transition of the Blue Economy, promoting sustainability and regenerative practices whilst supporting innovation and competitiveness?"
- Challenge Two:** Features a rocky coastline image. Title: "EMODnet for a Healthy and Productive Marine Environment". Description: "How might we leverage EMODnet's diverse in situ data and data products to support EU Policies for the marine environment, by enhancing the multi-disciplinary evidence base for the Marine Strategy Framework Directive (MSFD) and Birds and Habitats Directive (BHD) in the wider context of the EU Green Deal?"
- Challenge Three:** Features a sunset over the ocean image. Title: "EMODnet for Managing the Use of our Seas and Ocean". Description: "How can EMODnet's in situ data and data products support climate smart Maritime Spatial Planning (MSP) at national or cross-border levels? This challenge invites participants to explore how in situ data can help ensure that MSPs are comprehensive and adaptive to current and future trends. How can the data inform decisions on human activities and address the unique needs of different marine regions to achieve an ecological, economic, and social balance?"
- Challenge Four:** Features a coastal landscape with wind turbines image. Title: "EMODnet for the Coast". Description: "How can EMODnet's in situ data and data products be used to develop applications that assess the status of the coastal zone and the health of coastal ecosystems? This challenge focuses on using EMODnet's in situ data offer for the coastal region, where relevant supplemented by other open data sources, to produce applications and solutions for the Blue Economy, ocean management and wider society to better understand and mitigate coastal issues, including those linked with climate change adaptation & mitigation strategies."
- Challenge Five:** Features a ship's deck image. Title: "Wild Card! Hack the Ocean with EDITO (Open challenge)". Description: "How can participants utilize the EDITO platform to create innovative solutions with the European Digital Twin Ocean? What unique approaches can combine EMODnet in situ data with Copernicus resources like satellite observations and climate models? How might other open data sources further enhance these solutions when integrated with EMODnet data? With no set theme or domain, what creative ideas could showcase the potential of the Digital Twin Ocean to deliver impactful societal solutions?"

Figure 2. Overview of the five OSL 4.0 challenges

2.2 Communication Campaign and Participants

The fourth edition of the EMODnet Open Sea Lab (OSL 4.0) hackathon continued to harness the advantages of a fully virtual format, further transcending geographical limitations to unite a global community around marine innovation. By maintaining an accessible, digital-first approach, OSL 4.0 successfully attracted a diverse and extensive participant base from around the world.

The decision to host the hackathon virtually once again proved highly effective, drawing registrations from 401 individuals. This remarkable turnout underscores the broad appeal and significant impact of the event's robust communication campaign. Leveraging strategic outreach across various digital platforms, social media, and targeted networks, the campaign captured the attention of a diverse range of participants, including marine researchers, students, data scientists, developers, businesses, public administration professionals, non-governmental organisations (NGOs), and engaged citizens.

Central to OSL 4.0's mission was the expansion and diversification of the EMODnet community, fostering collaboration and innovation through inclusive participation. Participants from varied professional and academic backgrounds - such as coding specialists, communication professionals, marine scientists, data analysts, and environmental enthusiasts (Figure 9) - came together in the virtual space, driving the collaborative creation of innovative and practical solutions to pressing ocean-related challenges.



Figure 3. Overview of OSL 4.0 paid advertising campaign results

The virtual environment offered unique opportunities for real-time global collaboration, enabling participants to engage seamlessly, irrespective of their physical location. This virtual setting nurtured a dynamic and inclusive community, rich in diverse perspectives and expertise, which significantly

enriched discussions, idea exchanges, and ultimately, the quality of innovation during the hackathon.

The success and effectiveness of the communication campaign were clearly demonstrated by the impressive participant engagement and turnout for the event. By emphasising the hackathon's potential to contribute meaningful, data-driven solutions to marine conservation and ocean management challenges, the organisers successfully resonated with and mobilised a global audience passionate about marine science and technology. This strategic messaging not only ensured extensive global participation but also reinforced the hackathon's position as a significant event driving marine innovation worldwide.

2.3 Registration and Team Formation

The official OSL 4.0 website³ offered an intuitive and comprehensive platform that served as a central resource and information hub for participants and stakeholders. The registration period for OSL 4.0 ran from December 2024 to March 2025, during which participants were required to create profiles and complete an online registration form. A comprehensive "Starter Kit" was made available to participants, providing essential details and step-by-step guidance on the hackathon process. The kit included information such as how to navigate the virtual hackathon platform, form or join teams, access necessary resources, submit deliverables, and guidelines for each phase of participation.

Participants were encouraged to create teams of between three to ten individuals, with at least one team member possessing strong technical expertise in IT or data science. While individual registrations were welcomed, each participant needed to join a team, as solo participation was not permitted.

Registration details, along with comprehensive challenge descriptions, were clearly presented on the OSL 4.0 website, simplifying the process and improving accessibility. The user-friendly nature of the registration process was well-received, as confirmed by positive participant feedback collected post-event (see survey results in section 1.6 below).

Upon completion of registration, participants were directed to the Event Tornado platform⁴, which hosted the virtual hackathon activities. This platform facilitated team formation based on shared interests, expertise, and objectives, encouraging multidisciplinary collaboration and innovative problem-solving. To ensure clarity and effective participation, detailed Terms and Conditions were provided, outlining the hackathon's structure, rules, objectives, and expectations.

Once teams were formed, further guidance was communicated through private team chats available on the hackathon platform (Figure 4). Essential updates, such as deadlines, mentor contact details, submission guidelines, and critical announcements, were consistently communicated. Additionally, participants were equipped with tutorial videos, written instructional materials, and presentation templates to enhance their preparation and deliverables.

³ <https://opensealab.eu/>

⁴ <https://eventornado.com/event/open-sea-lab-4#home>

EMODnet OPEN SEA LAB 4.0
Virtual hackathon

25-27 March 2025
#OSL

REGISTER NOW

Home Teams Mentors

EMODnet Open Sea Lab 4.0 Hackathon

Welcome!!!

Welcome to **EMODnet** Open Sea Lab 4.0, the flagship **EMODnet** Hackathon series!

Taking place virtually from 25–27 March 2025, this hackathon is your opportunity to shape the future of ocean sustainability and resilience.

Join innovators, developers, and ocean enthusiasts to create impactful solutions that harness the wealth of **EMODnet** services and the cutting-edge **EDITO** platform.

Dive into the challenges, make a difference, and contribute to restoring our ocean and waters!

The EMODnet Open Sea Lab 4.0 Hackathon is here!

EMODnet OPEN SEA LAB 4.0
Virtual Hackathon

25-27 March 2025
#OSL4

REGISTER NOW

HARNESS THE POWER OF EMODnet FOR THE EUROPEAN DIGITAL TWIN OCEAN

Timeline Europe/Berlin GMT+01:00

- ✓ Registrations and team formation opens
15 December @ 00:00
- ✓ Live Session #1 - INTRODUCING EMODnet OPEN SEA LAB 4.0 & Challenge 1 and 3
11 March @ 15:00
- ✓ Live Session #2 - CHALLENGE 5 & Introduction to EDITO
13 March @ 15:00
- ✓ Live Session #3 - MATCHMAKING & TEAM FORMATION
14 March @ 15:00
- ✓ Live Session #4 - CHALLENGE 4 & Introduction to EMODnet
18 March @ 15:00

Figure 4. Screenshot from the Event Tornado platform instructions page for the OSL 4.0 hackathon

The platform's interactive environment enabled vibrant exchanges among participants, fostering meaningful discussions, idea-sharing, and collaborations. This interactive and collaborative atmosphere not only encouraged innovation but also supported networking opportunities, allowing participants to build valuable professional and personal connections that extended beyond the event.

2.4 Coaches and Mentors

The Coaching & Mentoring Team once again proved instrumental in the successful delivery of the EMODnet OSL 4.0 hackathon. Coaches and mentors provided crucial guidance, expertise, and resources, supporting participants in realising their potential and effectively addressing the hackathon's challenges. Their dedicated involvement significantly enhanced the overall experience, even in moments when their contributions were less visible, reinforcing their importance to the hackathon's success.

In preparation for their critical roles, the EMODnet Secretariat organised a dedicated Training & Networking Day for the OSL 4.0 Coaching & Mentoring Team on 19 February 2025. This in-person event aimed at equipping coaches and mentors with the necessary insights, resources, and strategies to effectively support participants throughout the hackathon. Interactive sessions ensured comprehensive briefing and encouraged networking among the team, fostering a cohesive and collaborative atmosphere.

The continuity provided by returning coaches and mentors from previous editions greatly enriched the event, enabling a seamless transfer of knowledge and strengthening the overall guidance framework. Their familiarity with the hackathon's processes and objectives facilitated efficient support and created a robust foundation for collaborative success.



Figure 5. OSL 4.0 Coach

Each team member contributed specific expertise aligned with their role:

- Coaches, primarily data experts, offered targeted support, helping participants navigate EMODnet's resources, effectively use the map viewer, and exploit relevant datasets from the EMODnet Portal;
- Mentors, comprising marine researchers and specialists with substantial scientific backgrounds, offered strategic guidance, insights, and subject-specific expertise, directly supporting teams in developing innovative and effective solutions.

Additionally, each challenge was supported by a designated Lead Mentor, who delivered inspiring presentations during the event's warm-up phase. These Lead Mentors also guided participants on the strategic application of EMODnet data and supported organisers by assigning mentors to individual teams once formed. Furthermore, Lead Mentors played a crucial role in the preliminary evaluation process, assisting in the shortlisting of finalist teams for submission to the event judges.



Figure 6. OSL 4.0 Coach and Mentor team workshop on 19 February 2025 in Brussels. ©EMODnet Secretariat

2.5 Warm-Up Sessions and Resource Pack

In preparation for the OSL 4.0 Hackathon, participants were supported through a comprehensive series of five Warm-Up Sessions and the provision of an updated Resource Pack. These initiatives, coordinated by the EMODnet Secretariat, drew on expertise from EMODnet and the Copernicus Marine Service to equip participants with essential knowledge and resources, ensuring they were fully prepared to maximise their hackathon experience.

The Warm-Up Sessions for OSL 4.0 were strategically organised as follows:

- **Session 1** (12 March 2025): Focused on Challenges 1 and 3, introducing key issues, available data, and initial guidance;
- **Session 2** (13 March 2025): Addressed Challenge 5 and EDITO, outlining critical insights and offering detailed information relevant to these areas;
- **Session 3** (14 March 2025): Facilitated matchmaking and team formation, enabling participants to connect, exchange expertise, and build strong teams;
- **Session 4** (18 March 2025): Covered Challenge 4, EMODnet, and the EMODnet Map Viewer, providing hands-on demonstrations and practical guidance for effective data exploration;
- **Session 5** (20 March 2025): Examined Challenge 2 alongside discussions on the Blue Economy, emphasising its importance and presenting relevant data applications.

Each Warm-Up Session was carefully designed to include presentations from distinguished experts and representatives from organising institutions and the Directorate-General for Maritime Affairs and Fisheries (DG MARE), enhancing participants' understanding and readiness.

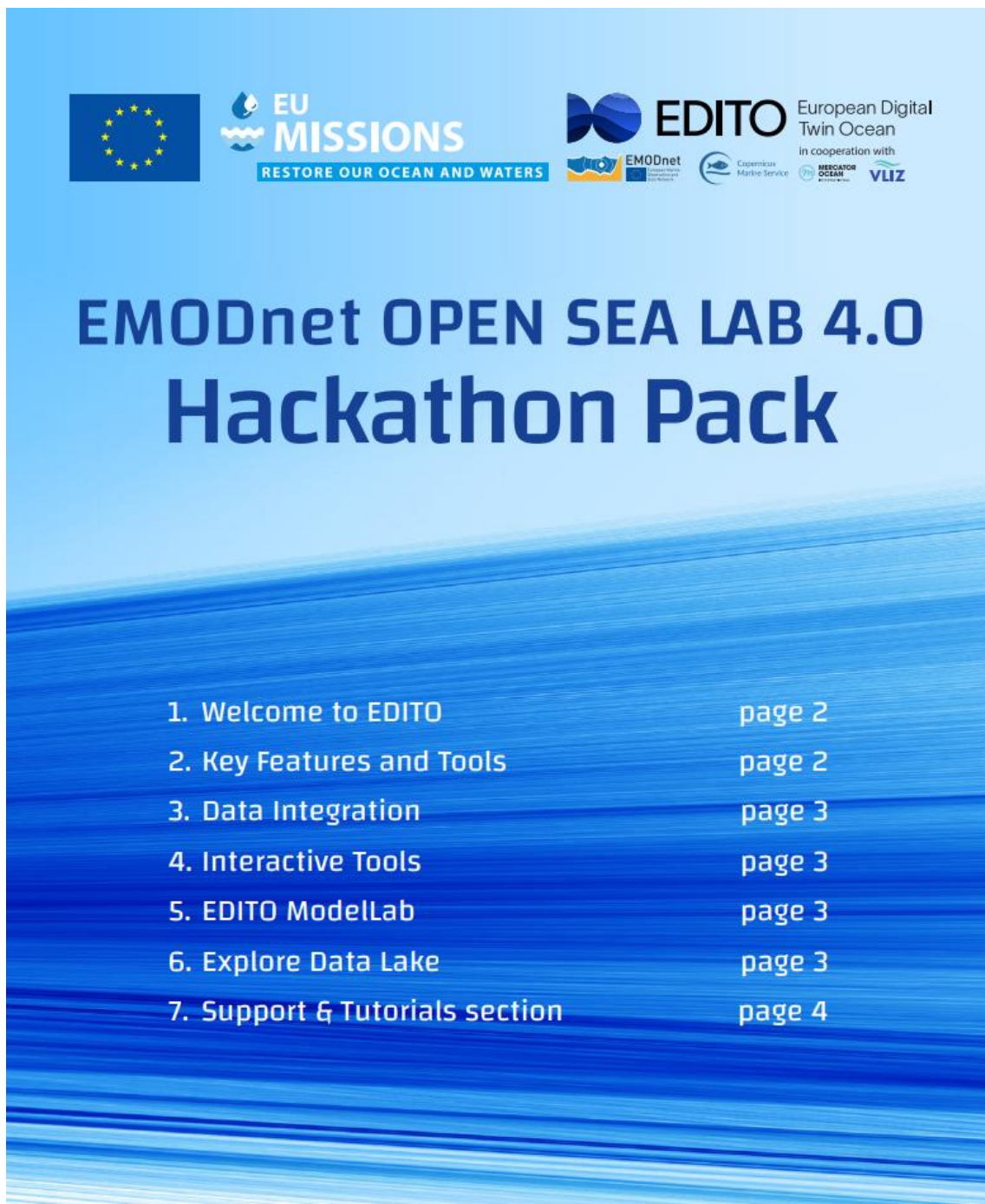


Figure 7. OSL 4.0 Resource Pack cover

The Resource Pack provided for OSL 4.0 served as an extensive guide for accessing and utilising open marine data. It included comprehensive instructions on discovering, visualising, filtering, and downloading data from EMODnet thematic areas (bathymetry, biology, chemistry, geology, human

activities, physics, seabed habitats), marine remote sensing, and forecast data from the Copernicus Marine Service.

Additionally, the Resource Pack detailed how participants could effectively navigate EMODnet platforms, including the Map Viewer, EMODnet Catalogue, and Web Services. It also provided guidelines for integrating EMODnet data services into various programming languages and GIS software, fostering innovative data-driven applications.

The Warm-Up Sessions and Resource Pack significantly contributed to a supportive, informative environment that enhanced participant capabilities and promoted the innovative use of marine data to address the challenges presented at OSL 4.0.

2.6 Participants Survey

A survey conducted among OSL 4.0 participants revealed high overall satisfaction with the organisation of the event, while also highlighting areas for improvement. See below for highlights on the survey results.



Figure 8. OSL 4.0 survey banner

General experience and satisfaction

- Overall satisfaction averaged 4.1 out of 5;
- Most participants expressed a strong willingness to join future EMODnet hackathons, with an average rating of 4.4 out of 5.

Platform and onboarding

- Hackathon website: Majority found the information clear and helpful (9 said "Agree", 8 "Strongly Agree");
- Eventornado registration was generally smooth: 10 said "Agree", 9 "Strongly Agree;"
- Team formation on Eventornado worked well for many, though some found the response time slow or unclear (10 said "Agree", 6 "Strongly Agree");
- Joining Discord was easy for most, though a few struggled with the process.

Team collaboration

- Most respondents praised their teams, with 12 stating their teammates were "Always available" and "Supportive;"
- A few experienced issues with team engagement or technical expertise mismatches.

What worked well

Participants highlighted:

- The warm-up sessions and overall communication;
- A strong sense of teamwork and collaboration;
- Clear deliverables and a well-structured hack guide;
- Access to platforms like Discord and Eventornado, which facilitated communication and submission.

Areas for improvement

Recurring themes included:

- Extended hackathon duration (some felt 2 days was too short);
- Easier access to materials and better navigation on the platform;
- Suggestions to involve past winners or "real-world challenge sponsors" for inspiration and continuity.

Moving ideas forward

Participants suggested:

- Public listing and visibility of all submitted ideas;
- Creating an alumni network to continue collaboration;
- Funding or incubation support for promising ideas;
- Continued spotlight and access to EMODnet resources.

Many participants expressed gratitude for the opportunity, especially first-timers. Some suggested expanding the initiative beyond the EU, especially in coastal regions of Southeast Asia. The overall tone was highly positive, with participants appreciating the openness, support, and learning environment.

2.7 The 3-day Online Hackathon and Jury Deliberations

The OSL 4.0 Hackathon took place over three days. Given its fully virtual format and global participation across multiple time zones, the event officially commenced with a brief online welcome session at 10:00 CEST on 25 March 2025. Immediately after the launch ceremony, teams began their intensive work, dedicating time to developing their projects until the close of the hackathon on 27 March.

A participant poll conducted during the launch revealed the geographical distribution of attendees: 95% were from Europe, while Africa and Asia each contributed 2%. A detailed participant breakdown indicated marine scientists formed the largest group (32.3%), followed by students (29.2%) and data scientists (20%).

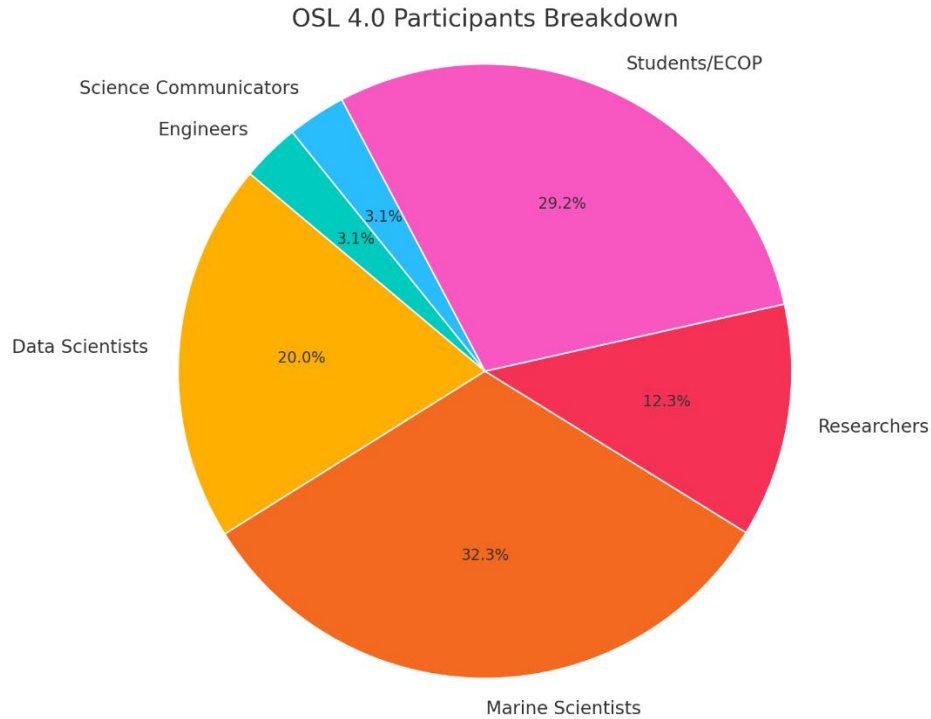


Figure 9. Breakdown of OSL 4.0 participants

Throughout the three-day event, participants collaborated remotely via the hackathon/Event Tornado platform, maintained regular interactions with their assigned mentors and coaches, and received continuous support from Lead Mentors. In addition to the main projects, participants engaged in "mini challenges," offering opportunities for creative interaction and additional recognition.

OSL 4.0 Mini-challenges

The first mini challenge tasked participants with writing and sharing a poem on social media (up to eight lines) inspired by EMODnet, EDITO, ocean data, or ocean sustainability challenges. The second mini challenge involved a marine data "treasure hunt," encouraging participants to discover and share intriguing marine data facts from EMODnet. These activities were designed to foster teamwork, creativity, and a collaborative spirit within the remote teams. Winners of these mini challenges gained exclusive access to EDITO, a particularly valuable reward given the platform's Beta testing phase.

EMODnet POEM AND TREASURE HUNT!

EMODnet POEM	EMODnet DATA TREASURE HUNT
<p>✦ Write a short poem (max 8 lines) inspired by EMODnet, EDITO, ocean data, and ocean sustainability challenges and post it on LinkedIn!</p> <p>🎯 Goal: Explain how EDITO can help capture the beauty, challenges, or importance of the ocean using data-driven themes (e.g., blue economy green transition, healthy and productive marine environment, use of seas and oceans, and the coast).</p>	<p>Can you find and share an interesting or unexpected marine data fact using EMODnet?</p> <p>📌 How to participate:</p> <ul style="list-style-type: none">1 Go to EMODnet Map Viewer2 Find an intriguing dataset, a surprising map feature, or something cool related to the ocean!3 Take a screenshot and post it on LinkedIn

Figure 10. The OSL 4.0 Mini Challenges

After three intense days, teams submitted their final deliverables for evaluation. Lead Mentors played a vital role in the initial pre-evaluation phase, identifying the ten strongest submissions for the jury's consideration.



Figure 11. The OSL 4.0 Lead Mentors

The evaluation criteria for the "proof of concept" submissions were structured around several key aspects:

- Fitness-for-purpose (10 points): Clearly identifying a relevant problem, the solution's contribution to addressing that problem, and its intended beneficiaries;
- Use of Data (10 points): Effective integration of EMODnet Central Portal datasets and other data resources, focusing on interoperability and data reusability;
- Visualisation (10 points): Demonstrating the concept's ability to present data effectively to both specialist and general audiences;
- Maturity (10 points): Evaluating the development stage of the prototype, including clear project outlines, tested functionality, and scalability potential;
- Roadmap for User Uptake (5 points): Assessing the practicality and effectiveness of proposed outreach strategies over the next 3-6 months, including realistic timelines and resource management;

- Quality of Video-Pitch (5 points): Measuring the clarity, impact, and overall quality of the team’s video presentations;
- Additional bonus points were available: 5 points awarded to teams with at least one student member and another 5 points for clearly presenting a use case linked to EMODnet services.



Figure 12. The OSL 4.0 Jury

2.8 Pitching of Projects and Award Ceremony

A second round of evaluation occurred live during the Pitching & Award Ceremony, held at 15:00 on 27 March. The ceremony kicked off with a welcome from European Commission representatives and the introduction of the OSL 4.0 jury. After this, the 10 shortlisted entries gave video pitches of their projects, after which they responded to questions members of the jury.

Following the interaction, the jury deliberated privately, assigning an additional 50 points to each team. The cumulative scores from both evaluation rounds determined the final rankings. The top five ideas received awards, with special recognition given to the two overall winning teams. These winners earned the opportunity to present their projects at the European Maritime Day in Cork, Ireland, in May 2025.



Figure 13. Participants describe the hackathon in one word.

Following the pitching and Q&A session final evaluation round by the jury members, the awaited moment arrived as the winners of the Open Sea Lab 4.0 hackathon were announced. The first winners to be announced were the winners of the mini challenges, with **Zahra Safaei** declared winner of the poem competition and **Martina Gaglioti** the winner of the treasure hunt.



Figure 14. Mini challenge prize

The winners of the Mini Challenges received exclusive access to the EDITO Platform⁵, offering advanced tools and resources to further develop their ideas.

⁵ <https://www.edito.eu/>

The next announcement highlighted the five projects selected as the top ideas from OSL 4.0. According to the jury, these promising initiatives were close to being fully developed and required just a bit more work to reach full maturity. The five best ideas were:

The Carbon Games - NAUT-XR



Team The Carbon Games developed "NautXR," an immersive Extended Reality (XR) platform that transforms marine datasets into interactive underwater worlds, initially focusing on historical shipwrecks. This project transforms Copernicus Marine data into immersive 3D underwater experiences aimed at educators and ocean enthusiasts. By integrating real-time marine conditions, shipwreck data, and substrate maps into a virtual environment, NAUT-XR allows users to dive into a realistic simulation of the seabed and ocean currents. The experience is both educational and exploratory, showcasing how human activity and natural elements interact beneath the sea surface.

Blue Crabs - Just Invaders or Clear Shifts Sentinels



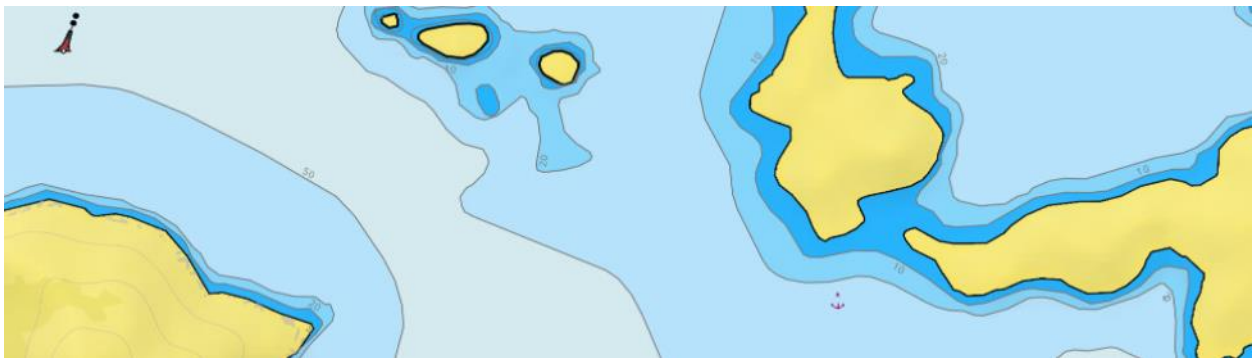
Team Blue Crabs, focused on the spread of invasive species, particularly blue crabs, this project explores how such organisms can serve not only as a challenge but also as indicators of broader environmental shifts. The team proposes a model that integrates multiple data sources to assess ecological impacts and serve as an early warning system. While currently centred on the blue crab, the approach could be applied to other invasive species and adapted across different case studies.

The Sea Breeze – Smart Subsea Cable Route Planner



The team Sea Breeze offers a smart solution for planning routes of subsea cables, which are essential for offshore wind and telecom infrastructures. The “Smart Subsea Cable Route Planner” tool processes spatial datasets on military zones, marine traffic, and ecological constraints, and applies a least-cost path algorithm to identify optimal, low-impact cable routes. This reduces environmental disruption and administrative hurdles, while improving infrastructure resilience.

Maptoolkit - Seamap 2.0: the Open Data Nautical Chart for Europe



Seamap 2.0 of team Maptoolkit addresses the need for updated and integrated nautical maps for recreational maritime use. By pulling data from sources such as EMODnet, Copernicus Marine, and OpenStreetMap, the platform provides bathymetric, weather, and habitat data in real-time. The project stands out for its effort to create a comprehensive, user-friendly, open-access nautical chart system across European waters, addressing addresses critical needs in marine transportation, research, and leisure sectors.

ReefGuardians – Bioengineered ‘Living Breakwaters’ for Climate-Resilient Coastlines



The ReefGuardians project proposes building bioengineered breakwaters that not only protect coastlines from erosion and extreme weather but also foster marine biodiversity and local community engagement. The team partners with local fishermen and youth in Sardinia to co-design structures that integrate scientific expertise and traditional knowledge. The initiative supports both ecosystem regeneration and a sustainable blue economy.

These five projects each received a €500 experience gift voucher which can be redeemed anywhere they are located, rewarding their outstanding ideas with the chance to enjoy unforgettable experiences of their choice.



Figure 15: Prize vouchers for the five best ideas in OSL 4.0

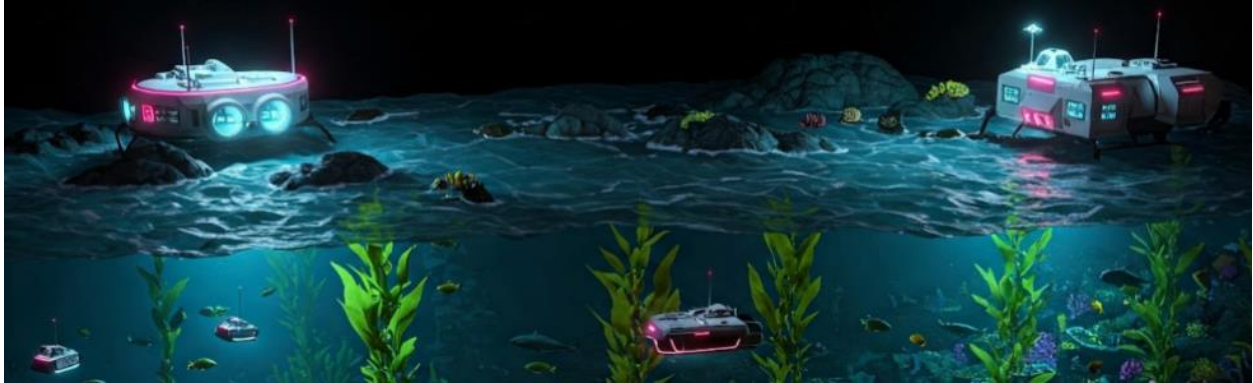
Finally, the two winning teams were announced. These two teams were given the opportunity to showcase their idea at the European Maritime Day 2025 in Cork, Ireland, where they presented their innovations, gaining visibility and recognition at this flagship European marine community event. In no particular order, the two winning teams were:

Digital Lighthouse



Digital Lighthouse offers a decision-support platform that brings transparency and traceability to ocean data, helping stakeholders - ranging from policymakers to citizens - make sense of complex marine data. The tool bridges the gap between data and action, allowing for informed decisions about marine planning and conservation. It was praised for its potential long-term impact and accessibility.

Economitor



Economitor focuses on tracking and visualising the economic impacts of climate change on coastal regions. By combining environmental datasets with socio-economic indicators, the platform provides insights into how changing marine conditions affect local economies. It serves as a valuable tool for policymakers and planners aiming to build resilient coastal communities.

The two winning teams sent two members each to European Maritime Day, which was held this year in Cork, Ireland, on 21-23 May 2025.



Figure 16. OSL 4.0 main prize

3 Looking Forward to Open Sea Lab 5.0

The EMODnet Open Sea Lab has become an increasingly popular and influential series of hackathons. The growth in community interest and participation underscores its value: from 48 applications and five teams in the first edition, rising to 120 applications and 16 teams in OSL 2.0, and continuing with strong participation of more than 500 registrations and 39 team submissions in OSL 3.0. OSL 4.0 maintained robust engagement with over 400 registrations and 25 teams selected to tackle the hackathon's five key challenges.

OSL 4.0 demonstrated sustained enthusiasm and the continued relevance of fully virtual hackathons, effectively engaging global audiences and facilitating significant cross-disciplinary collaboration despite geographical distances. Returning participants from earlier editions highlighted the positive and impactful experience that OSL consistently provides. The online format retained a strong sense of community and camaraderie, boosted by interactive live sessions, robust mentor engagement, and creative participation through mini challenges.

In the lead-up to OSL 4.0, a series of warm-up sessions were organised to familiarise participants with the challenges, tools, and teams. These sessions provided early engagement opportunities and practical insights to support participants in preparing for the hackathon. The agenda included an introduction to OSL and Challenges 1 and 3 on 11 March 2025; Challenge 5 and the EDITO platform on 13 March; Matchmaking and Team Formation on 14 March; Challenge 4 and the EMODnet Map Viewer on 18 March; and Challenge 2 along with a session on the Blue Economy on 20 March. Similar preparatory sessions are foreseen in the run-up to OSL 5.0, helping to build momentum and foster collaboration well ahead of the main event.

As with previous editions, participant feedback from OSL 4.0, collected through a comprehensive post-event survey, will play a crucial role in shaping future iterations. This feedback ensures continuous improvement, helping to integrate lessons learned and best practices into future events to maximise their impact and enrich the participant experience.

Additionally, a short video showcasing the highlights of OSL 4.0 - including winning team pitches and event highlights - has been created to complement this report, further emphasising the event's vibrancy and innovation.

Looking towards Open Sea Lab 5.0, there is potential to further expand the event's scope and impact, possibly through hybrid formats that combine physical gatherings with remote participation across European and global nodes. Insights gained, along with valuable community feedback from both physical and virtual editions, will inform and enhance future hackathons, ensuring OSL continues to foster innovation and impactful collaboration in addressing pressing marine and environmental challenges.