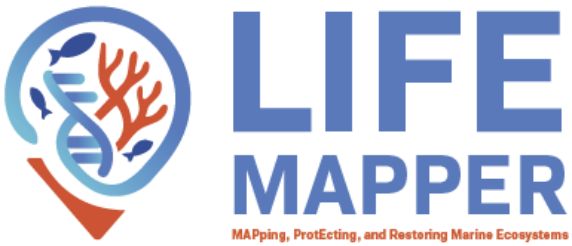

LIFE24-PRE-IT-LIFE-MAPPER

Guidelines for **MAP**ping, **P**rot**E**cting, and **R**estoring Marine Ecosystems

Deliverable or Milestone	Work Package 3 – Milestone 4
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Version	Date	Change	Page
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Executive Summary

CNR-ISMAR and University of Naples Federico II (UNINA) have organized the Restoration Workshop, held at the CNR Conference in Bologna on 11–12 December 2025.
The workshop represents a key milestone and is designed to bring together experts, researchers, stakeholders, and representatives from European restoration and conservation initiatives, providing an arena for discussion and exchange within the LIFE-MAPPER framework.

Objectives of the meeting

The workshop aims were to:

1. **Explore challenges** associated with restoration planning and implementation.
2. **Integrate diverse perspectives** into LIFE-MAPPER's methodological approach, strengthening dialogue between science, policy, and practitioners.
3. **Enhance synergies with major EU environmental policy frameworks**, including the Nature Restoration Regulation (NRR), the Marine Strategy Framework Directive (MSFD), the EU Biodiversity Strategy 2030

Workshop Structure

The workshop spans two days and includes:

- **Presentations** by European Commission representatives, project coordinators, and experts working on restoration, marine ecosystem assessment and policy implementation.
- **Showcase of ongoing EU projects**, such as REDRESS, LIFE DREAM, CLIMAREST, LIFE ECOREST, LIFE LOPHELIA, PNRR MER, and NBFC restoration activities.
- **Interactive sessions** (Kahoot session -based) focusing on specific questions regarding restoration activities, legislative frameworks, readiness of implementation, and knowledge gaps.
- Dedicated slots for **knowledge platform development** and **digital restoration tools**.
- **Networking** opportunities.

Restoration Workshop

Bologna, 11–12 December

DAY 1

13:00-14:00	**Lunch and registration**
14:00-14:15	**Introduction and logistics**
14:15-14:45	**Setting the scene on the Nature Restoration Regulation** Maddalena Visser (DG Environment)
14:45-15:15	**LIFE MAPPER introduction** Federica Foglini (CNR ISMAR) Simonetta Fraschetti (University of Naples Federico II)
15:15-15:35	**SER Working Group on restoration** Sahar Stevenson-Jones (SER-Europe)
15:35-16:00	**Coffee break**
16:00-17:00	**Presentation of ongoing projects** • **REDRESS** – Cristina Gambi (Università Politecnica delle Marche) and Anthony Grehan (University of Galway) • **LIFE DREAM** – Federica Foglini (CNR ISMAR) • **CLIMAREST** – Joao Monteiro (ARDITI) • **LIFE ECOREST** – Jordi Grinjo (CSIC) • **LIFE LOPHELIA** Ann Larson (University of Göthenborg) • **PNRR MER** – Sasa Raicevich (ISPRA) • **NBFC Restoration Activities and Manual** Mariachiara Chiantore e Monica Montefalcone (UNIGE)
17:00-17:10	**Knowledge Platform (Digital Restoration)** Sanja Jelena Gargano (Space42)
17:10-18:00	**First-day concluding remarks**
18:00-20:00	**Networking aperitif**

DAY 2

09:00-09:30	**Strategic Planning for Nature Restoration** (Marine Ecosystems) **and National Restoration Plans** Lynne Barratt (ELMEN) Eirini Glyki (EEA)
09:30-09:45	**Strategic planning for EU Nature Restoration: the Blue Perspective** Roberto Danovaro (UNIVPM)
09:45-10:05	**Mapping and condition assessment gaps of marine habitats** Ute Jacob (Bioagora)
10:05-11:10	**Discussion session to address together the assessment of conditions, thresholds, and the definition of the favorable reference area** (Kahoot session)
11:10-11:30	**Coffee break**
11:30-13:00	**Discussion session to address together the assessment of conditions, thresholds, and the definition of the favorable reference area** (Kahoot session, continued)
13:00-13:30	**Wrap-up and conclusions**
13:30-14:30	**Networking lunch**

How to Get There

By car coming from the A14 motorway: take the "Bologna Arcoveggio" exit.

By car coming From the Ring Road ("Tangenziale"): take exit no. 5 "Quartiere Lame".

By train – From Bologna Centrale station: take a taxi (approx. 5 minutes) or bus lines 87, 37 or 34.

By plane – From Bologna "Guglielmo Marconi" airport: take the Aerobus to the railway station (~7 minutes) then bus or taxi to the venue (≈ 10 minutes).

Nearby hotels:

HC3: https://www.hc3.it/

Astor: https://www.astor-hotel.it/

Il Guercino: https://www.guercino.it/ this is closer to the city center

More hotels here:

https://www.bo.cnr.it/congressi/index.php/selezione-di-alberghi/

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Workshop with marine restoration experts in Bologna

This document summarizes the key discussions, presentations, and ongoing initiatives from the event in Bologna on marine ecosystem restoration, with a focus on the implementation of the EU Nature Restoration Regulation (NRR).

Day 1 set the policy and operational context of the NRR. The Regulation establishes progressive restoration targets for marine habitats and promotes coordinated actions across sectors, including fisheries (CFP). The LIFE MAPPER project was presented as a key support instrument for Member States, developing harmonized guidelines, assessment frameworks, restoration protocols, and cost estimation tools.
Several ongoing and concluded projects (REDRESS, LIFE DREAM, CLIMAREST, LIFE ECOREST, PNRR MER, and NBFC) illustrated how marine restoration is being implemented across different depth ranges, habitat types, and governance contexts. Collectively, these initiatives highlight Europe's efforts to integrate scientific knowledge, practical restoration actions, and policy guidance to achieve resilient and well-connected marine ecosystems, while delivering tools, data, and operational experience to support Member States in planning and implementing the NRR effectively.

Day 2 focused on strategic implementation of National Restoration Plans (NRPs). The discussion outlined upcoming reporting requirements, indicator harmonization, and data flows supporting NRR implementation. Scientific perspectives stressed the need for shared definitions, robust methodological frameworks, and long-term monitoring to ensure restoration effectiveness. Key challenges discussed included defining habitat condition, thresholds, and favourable reference areas, which remain uncertain. An interactive Kahoot session highlighted common gaps, varying levels of data maturity, and the importance of viewing NRPs as adaptive planning tools that initiate a transparent and iterative restoration process.

Day 1 – 11/12/2025

Setting the scene on the Nature Restoration Regulation
Speaker: Maddalena Visser (DG Environment)

Maddalena Visser highlighted the critical role of the Nature Restoration Regulation (NRR) in addressing the degradation of European marine ecosystems, emphasizing that **Marine Protected Areas alone are not sufficient**. The NRR establishes a unified, ecosystem-based framework, building on the Habitats Directive and Marine Strategy Framework Directive, and promotes cross-sectoral collaboration among Member States. It sets progressive restoration targets for 233 marine habitat types, with objectives for 2030, 2040, and 2050, and aligns soft-sediment habitat targets with MSFD Good Environmental Status standards. The regulation encourages Member States to begin **implementing measures using existing data**, while addressing **knowledge gaps** over time. Visser stressed the importance of restoring species habitats, maintaining ecological connectivity, and integrating fisheries management measures. Projects like LIFE MAPPER provide essential tools and methodologies to support habitat assessment, restoration planning, and effective large-scale marine restoration, even when starting with initial approaches to be refined as knowledge grows.

LIFE MAPPER Introduction
Speakers: Federica Foglini (CNR ISMAR) & Simonetta Fraschetti (University of Naples Federico II)

Federica Foglini presented the LIFE MAPPER project, which started in May and will run for 36 months, aiming to support the implementation of the NRR across all European seas. The project will produce a **manual** and **interactive knowledge platform** compiling best practices, protocols, and tools for marine habitat mapping, condition assessment, restoration planning, cost estimation, and spatial prioritization. LIFE MAPPER will capitalize on existing initiatives and data portals, integrating diverse sources to provide user-friendly, accessible information to Member States, scientists, and policymakers needed to implement the Nature Restoration Regulation effectively and at scale across Europe.

Simonetta Fraschetti explained that LIFE MAPPER is developing guidelines and recommendations for assessing the status and condition of European marine habitats, building on existing knowledge from the Habitats Directive and the Marine Strategy Framework Directive. She highlighted the challenge of defining **thresholds** between good and degraded conditions, which can vary across regions and habitats, and emphasized that LIFE MAPPER will integrate scientific evidence, past restoration projects, and practical experience. The project will systematically review active restoration methods, successes and failures, cost estimations, and spatial prioritization, linking restoration planning with marine spatial planning principles. To support this work, LIFE MAPPER will also circulate **questionnaires** at the European scale,

aiming to gather input from Member States while minimizing survey fatigue, ensuring that the guidance reflects both scientific evidence and practical management needs.

SER Working Group on restoration
Speaker: Sahar Stevenson-Jones (SER-Europe)

Sahr Stevenson Jones presented the role of SER Europe and its Marine Restoration Working Group (MRWG) in supporting the **implementation of the EU NRR.** She emphasized the complexity of marine restoration, where shifting habitats, data gaps, and climate-driven changes make historical baselines challenging. SER Europe translates scientific knowledge into actionable guidance, helping Member States define **favourable reference areas**, plan restoration for ecological viability, and integrate future resilience. The MRWG brings together over 75 experts and collaborates with pan-European alliances to develop harmonized guidelines, monitoring tools, and best practices, including a marine-adapted version of the SER Ecological Recovery Wheel, ensuring restoration is scientifically robust, operationally feasible, and globally aligned. Overall, SER Europe positions Europe as a leader in marine restoration, bridging science, policy, and practice to meet NRR targets.

Presentation of ongoing and concluded projects
REDRESS
Speakers: Cristina Gambi (Università Politecnica delle Marche) & Anthony Grehan (University of Galway)

REDRESS is an Horizon-funded initiative dedicated to the **restoration of deep-sea habitats** across European seas. Its main objectives are to demonstrate the feasibility, sustainability, and ecological and economic value of deep-sea restoration, and to provide guidance for upscaling restoration projects. The project runs for four years and involves 26 partners from 15 countries, spanning academia, research institutes, small enterprises, and NGOs.

Key activities include:

- **Mapping degraded marine ecosystems** to identify priority restoration sites, including cold-water coral reefs, coral gardens, and soft-bottom communities.
- **Field restoration interventions** using innovative approaches, such as 3D-printed artificial reefs (eco-reefs) and landers for larval recruitment, enabling the transfer of coral larvae to impacted areas.

- **Monitoring and evaluating restoration success**, combined with economic cost-benefit analyses and assessment of legal and governance frameworks to support practical implementation.
- **Dissemination and communication** to share results with policymakers, stakeholders, and the public.

Restoration site selection prioritizes areas with confirmed habitat damage, including sites within the European Coral Belt (France, Ireland, UK, Iceland and the Mediterranean). Sites are protected from further impacts where possible. A critical challenge is defining **favourable reference areas** using both historical records and modern surveys, acknowledging that historical baselines may underestimate deeper-water habitat extent.

The project places strong emphasis on careful assessment of **habitat condition**, recognizing that ecosystems that appear degraded may instead reflect natural environmental limits. Restoration efforts integrate experimental modules with living coral transplants, using standardized methods across sites to allow robust comparison and evaluation of effectiveness.

LIFE DREAM

Speaker: Federica Foglini (CNR ISMAR)

LIFE DREAM focuses on the **restoration and conservation of deep Mediterranean habitats**, addressing key threats like marine litter, climate change, and other human impacts. Unlike many LIFE projects that focus on shallower waters, LIFE DREAM targets deep-sea ecosystems, including cold-water coral reefs, deep oyster beds, and coralligenous formations.

Key points:

- **Main threats addressed:** Marine litter, alongside climate change and direct human impacts.
- **Restoration strategies:** Passive restoration, with the removal of plastics using ROVs; collaboration with fishers to prevent further accumulation. Active restoration with the deployment of 3D-printed artificial reefs to provide new substrate and habitat for corals.
- **Monitoring:** Underwater cameras record hourly images; AI tools will be used to analyze colonization and ecosystem recovery over time.
- **Circular economy initiative:** Collected plastics are transformed into fuel, combining restoration with innovative recycling.

- **Pilot sites:** Four Mediterranean locations, including Bari Canyon, Dorm Canyon, and sites in Spain and Greece.
- **Conservation integration:** Restoration actions are linked with the Natura 2000 network to ensure long-term habitat protection.

CLIMAREST

Speaker: Joao Monteiro (ARDITI)

CLIMAREST is a Horizon Europe funded project that aims to improve ecosystem restoration and climate resilience in coastal regions from the High Arctic (Svalbard) to the Atlantic (Madeira). The key goals of the project are to:

- Develop and test a modular **restoration toolbox** that integrates expert knowledge, scientific information, stakeholder and community engagement, cost-benefit analysis, priority setting, and tailored protocols for restoring and monitoring diverse coastal habitats.
- Demonstrate the **effectiveness of these tools and approaches** in **five different coastal ecosystems** with varying environmental conditions, pressures, and biodiversity values, providing real-world testing grounds across latitudinal gradients.
- **Optimise and refine the toolbox** so it can be replicated and upscaled in similar coastal environments across Europe and beyond.
- Ensure tools and guidelines are **accessible** to practitioners and policymakers to support effective restoration planning, climate resilience, and long-term sustainability of coastal ecosystems.

Overall, CLIMAREST seeks to **bridge the gap between research and practical restoration action**, enhancing the capacity of local communities and stakeholders to implement resilient and scalable coastal restoration solutions.

LIFE ECOREST

Speaker: Jordi Grinjo (CSIC)

LIFE ECOREST is a European LIFE project aimed at restoring nearly 30,000 hectares of deep-sea habitats off the coast of Girona and Barcelona in the northwestern Mediterranean, focusing on areas with high ecological value and severe degradation due to fishing activities.

Main objectives:

- **Improve the conservation status of deep-sea benthic habitats** through active restoration measures.
- **Validate the effectiveness of restoration strategies**, including the recovery and transplanting of key structuring species such as corals, gorgonians, sponges, and other sessile organisms.
- **Assess the recovery of ecosystem services** in restored areas and adjacent fishing grounds.
- **Promote a participatory approach to fisheries management** by involving fishers directly in restoration and governance processes.
- **Create dialogue and strengthen governance mechanisms** to support active habitat restoration and integrate it into management plans for protected areas.
- **Raise awareness** among local communities, stakeholders, and the fishing sector about the ecological importance and fragility of deep marine habitats.
- **Replicate and transfer restoration and governance approaches** to other Mediterranean areas where benthic habitats are threatened.

The project is coordinated by the Institut de Ciències del Mar (ICM-CSIC) with partners including fishing cooperatives, academic institutions, and WWF Spain. It runs until 2026 and emphasizes collaboration with the fishing sector to implement and scale restoration action.

PNRR MER – Marine Ecosystem Restoration (Italy, Next Generation EU funding)
Speaker: Sasa Raicevich (ISPRA)

PNRR MER (Marine Ecosystem Restoration) is the largest marine restoration initiative under Italy's National Recovery and Resilience Plan (PNRR), funded with approximately €400 million and coordinated by ISPRA under the Ministry of the Environment and Energy Security. It runs from 2022 to 2026 and is part of Mission 2 ("Green Revolution and Ecological Transition"), Component 4 ("Protection of territory and water resources").

Main objectives and activities:

- **Restore and protect seabed and marine habitats** through targeted interventions, including rebuilding European flat oyster (*Ostrea edulis*) reefs in five Adriatic regions, which act as ecosystem engineers similar to coral reefs.
- **Comprehensively map coastal and marine habitats** along the entire Italian coast using state-of-the-art technologies (satellite and airborne sensors, multibeam

bathymetry, and autonomous underwater vehicles) to provide consistent, high-resolution habitat data.

- **Strengthen the national marine and coastal ecosystem observation system**, including installation and upgrade of HF radar antennas and a network of offshore buoys for monitoring waves, currents, and weather parameters, as well as restoration of the National Ondametric Network.
- **Map deep habitats**, including around ~90 seamounts, to describe deep-sea biodiversity and support future protection measures.
- **Identify and restore areas impacted by abandoned fishing and aquaculture gear**, tackling marine litter by targeting at least 15 locations where ghost nets and derelict gear threaten local fauna and flora.

Overall, MER aims to enhance knowledge, monitoring, protection, and restoration of Italy's marine ecosystems by integrating advanced mapping, monitoring, and habitat restoration actions within the PNRR framework.

NBFC Restoration Activities and Manual
Speaker: Mariachiara Chiantore (UNIGE)

The National Biodiversity Future Center (NBFC) is an Italian NextGenerationEU-funded initiative involving over 1,000 researchers, structured around monitoring, conservation, restoration, and biodiversity valorization across marine, terrestrial, and urban ecosystems. Within NBFC, a dedicated marine restoration working group operates across 7 habitat types and 16 study areas, addressing 5 of the 7 marine habitat groups of the NRR.
Early restoration results are promising, with 60–80% survival rates, early signs of self-maintenance, and rapid recovery of associated biodiversity. A key strength of NBFC is the integration of Life Cycle Assessment, Natural Capital Accounting, and ecosystem service valuation, alongside strong capacity building, including national guidelines, a Catalogue of Nature-Based Solutions, and training initiatives. Overall, NBFC provides a coordinated national platform to support NRR implementation through science-based, large-scale restoration.

Day 2 – 12/12/2025

Strategic Planning for Nature Restoration (Marine Ecosystems) and National Restoration Plans
Speaker: Eirini Glyki (EEA)

Eirini Glyki outlined the Agency's role in supporting the implementation of the NRR, working closely with the European Commission and Member States. EEA activities focus on three main areas: translating the regulation into harmonized reporting formats and data flows, developing and managing biodiversity information systems, and supporting the selection and harmonization of indicators to track progress toward restoration targets. The first reporting on restoration measures is expected in 2028, followed by regular technical progress reports and six-yearly EU-wide assessments. Key knowledge products include the interpretation manual for the 233 marine habitat types listed in Annex II, linking habitats to pressures, restoration measures, and best practices.

Strategic planning for EU Nature Restoration: the Blue Perspective Roberto
Speaker: Roberto Danovaro (UNIVPM)

Roberto Danovaro stressed that effective ecosystem restoration requires a shared conceptual and methodological foundation, which is currently lacking. He emphasized that restoration must be understood as complementary to conservation, not as a justification for environmental degradation. A major challenge lies in the **lack of agreed definitions**, particularly regarding what constitutes restoration success, the role of **active *vs* passive** restoration, and how targets should be measured over time. He argued that **true restoration** is **inherently active**, while acknowledging that passive measures are essential for supporting and scaling recovery, and cautioned against equating passive recovery alone with restoration success. He also stressed the importance of maintenance and long-term monitoring, pointing out that restoration processes often unfold over decades and cannot be adequately captured by short-term indicators.

Finally, he noted that restoration can be effective even **under ongoing pressures** if risks are managed and interventions are well designed. He advocated for scaling up restoration through replication of small, well-planned actions, moving **beyond single-species approaches** toward ecosystem-level restoration.

Mapping and condition assessment gaps of marine habitats
Speaker: Ute Jacob (Bioagora)

Ute Jacob addressed key **conceptual challenges** in applying the Nature Restoration Regulation, focusing on definitions of habitat condition, benchmarks, and favourable reference areas. It was highlighted that the Regulation does not provide **an explicit**

operational definition of some key concepts, making it necessary to interpret and apply them consistently when selecting indicators and metrics to assess habitat condition and restoration progress.
Concerns were raised about potential misinterpretation of "**minimum**" thresholds, but it was clarified that definitions are fixed in the Regulation and that implementation should focus on selecting appropriate measures, justifying them, and monitoring their effectiveness rather than on semantic distinctions. The discussion highlighted the importance of shared understanding and documentation of early implementation experiences to support coherent application of the Regulation over time.

Discussion session to address together the assessment of conditions, thresholds, and the definition of the favourable reference area (Kahoot session)

The Kahoot session was used as an interactive tool to assess participants' involvement, perceptions, and challenges related to the development and implementation of National Restoration Plans. Because the discussions following the questions were extensive and well-articulated, the group decided to recirculate the questions, incorporating the key points raised, with the aim of developing the analysis into a publishable product. See also Annex 1 and 2 for a description of the results together with a preliminary analysis.

Following, the list of provided questions about **Conditions**, **Thresholds** and **Favourable Reference Area (FRA)**

First session: **NRPs developing**

1. Are you involved in the development of the national Restoration Plan of your country?
2. What are the main challenges or critical issues in implementing the national Restoration Plan of your country?
3. What are the strengths or positive aspects of developing the national Restoration Plan of your country?
4. In your opinion, what is the current level of maturity of the available information for assessing good conditions in your country?

5. In your opinion, what is the current level of maturity of the available information for defining Favourable Reference Areas (FRA) in your country?
6. To what extent do you think your country will be able to deliver a complete plan (condition assessment based on identified thresholds, FRA definition and measures) by the 2026 deadline?

Second session: **Habitat groups**

1. For which habitat groups (Habitats 1, 2, 3, 4, 5, 6, 7) is there a mature methodological framework for condition assessment?
2. For which habitat groups (Habitats 1, 2, 3, 4, 5, 6, 7) is there a mature methodological framework for defining thresholds?
3. For which habitat groups (Habitats 1, 2, 3, 4, 5, 6, 7) is there a mature methodological framework for defining the FRA?
4. Which approach - active or passive restoration - do you consider more effective for the different habitat groups?