BLUEMISSION AA

Building a coordination hub to support the mission implementation in the Atlantic and Arctic Basin

Baseline inventory of ecosystem restoration activities, actors and KPIs from project case studies (Update)

This project has received funding from the European Union's Horizon Europe Research and Innovation programme under Grant Agreement number 101093962.

Document Information

Project Name	BlueMissionAA – Building a coordination hub to support the Mission implementation in the Atlantic and Arctic Basin
Grant Number	101093962
Deliverable number	D2.2
Deliverable title	Baseline inventory of ecosystem restoration activities, actors and KPIs from project case studies (Update)
WP number	2
Deliverable due date	31 October 2024 (adjusted to 31 January 2025)
Submission date	31 January 2025
Dissemination levels	PU
Lead beneficiary	NIVA
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Internal reviewers	Harald HASLER-SHEETAL

Document history and changes

Version	Date	Author	Description
1	21.10.2024	Richard BELLERBY, Sebastian Maria Karl Heinrich KOPF	Draft Report
2	21.01.2025	Richard BELLERBY, Sebastian Maria Karl Heinrich KOPF	Edited version
3	30.01.2025	Richard BELLERBY, Sebastian Maria Karl Heinrich KOPF	Edited version
4	31.01.2025	Richard BELLERBY, Sebastian Maria Karl Heinrich KOPF	Report submitted

Authors | Richard BELLERBY, Sebastian Maria Karl Heinrich KOPF

Publisher |

How to cite | Richard BELLERBY, Sebastian Maria Karl Heinrich KOPF, 2025 *BLUEMISSIONAA Report D2.2*. Baseline inventory of ecosystem restoration activities, actors and KPIs from project case studies (Update). 14 pp.

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1. Executive Summary

This deliverable expands on D2.1 by incorporating new data and developments from ongoing activities and projects. This update reflects the progress and evolving scope of ecosystem restoration efforts, capturing refined and additional KPIs informed by recent research and collaboration. This D2.2 report integrates insights from expanded datasets and feedback from stakeholders within the Atlantic and Arctic basins, i.e., the six projects chosen as case studies within the BlueMissionAA project framework, enhancing the detail and precision of the inventory.

Through these updates, D2.2 strengthens the BlueMissionAA project's capacity for accurate, ongoing monitoring and reporting. By refining the baseline established in D2.1, D2.2 ensures that the inventory remains a valuable tool for assessing the Mission's restoration impact and supports adaptive management as restoration projects progress across Europe's marine ecosystems to the extent feasible under the grant agreement.

Results from this work have been delivered into the Wavelinks pipeline to further enhance the reliability, relevance and targeting of the tool.

2. Introduction

Purpose of this deliverable

This deliverable aims to provide an inventory of ecosystem restoration activities, actors and KPIs from the project case studies chosen in Task 1.3. This is part of the baseline study of recent and ongoing EU and R&I restoration programmes, projects, and national and European initiatives. The aim is to contribute to the monitoring of scientific, technical and data flow metrics for Mission KPIs. The document describes the approach to the assessments of the case study projects and an analysis based on the responses to a questionnaire to the project coordinators and main actors.

Overview of restoration approaches

Encouraged by multi-national actions including the UN Decade of Restoration, the EU Restoration Law under the EU Biodiversity Strategy, and the EU mission "Restore our Ocean and Waters", marine and coastal restoration is progressively becoming a core objective of marine managers to increasing the resilience and productiveness of marine systems in the face of multiple stressors following habitat loss and climate change. Restoration may result from passive approaches such as protection from fishing effort, from habitat improvement (pollution and nutrient abatement, plastic removal) and increasing habitat space through marine protected areas, or active approaches including restocking, grazer/predator management and artificial reefs. Active restoration action can be twinned with protective

management measures reduce stressors and promote good habitat status (van Dover et al., 2014). The ambition is to protect and maintain structural complexity and diversity, the second should be devoted to enhancing the conditions crucial for those features that make the success uncertain (Bekkby et al., 2020). Restoration efforts may focus on multi-species (McAfee et al., 2022) or mono-species, mainly foundation species, such as macroalgae (Bianchelli et al., 2023), oyster beds (Hughes et al., 2023), although the common goal is to build resilience in ecological function and socio-ecological value. An evaluation of the success of restoration actions requires prolonged monitoring of traits and functioning of the ecosystem in question (e.g. Galobart et al., 2023). Whilst it is often reported that restoration efforts have been a success, with initial strengthening of ecosystem functions the longevity of the investment and the delivery of ecosystem (Eger et al., 2022) and climate (Williamson et al., 2023) services, currently, there is no one framework to evaluate restoration success, although restoration reporting frameworks have been promoted (Abelson et al., 2020; Eger et al., 2022).

Methodology

2.3.1 Background from deliverable D2.1

The D2.1 report laid the groundwork as an initial baseline inventory of ecosystem restoration activities, actors, and KPIs, focusing on recent and ongoing projects relevant to the EU Mission Restore our Ocean and Waters by 2030. Developed as part of the BlueMissionAA project, D2.1 captured a snapshot of EU and national restoration efforts within the Atlantic and Arctic basins, cataloguing essential scientific and technical information across various restoration initiatives. This initial report was pivotal in setting up the structured approach to identify and monitor key performance indicators (KPIs), creating a resource that supports effective decision-making and progress tracking in alignment with Mission objectives.

2.3.2 Project case studies overview

In the following, the six project case studies are briefly introduced through information on the project websites. Each of these projects tackled unique aspects of ecosystem restoration and climate resilience, using innovative, community-based approaches to address environmental challenges in aquatic and coastal regions.

3D-PARE

The 3D-PARE project focused on developing innovative artificial reefs to support sustainable marine ecosystem management across the Atlantic Area. Facing challenges from tourism, resource exploitation, and pollution, Atlantic marine environments were experiencing severe reef degradation, threatening biodiversity and economic activities like fisheries and tourism. 3DPARE addressed these issues by creating eco-friendly, bio-receptive, and durable reefs using advanced 3D printing techniques and natural, renewable raw materials. These artificial reefs feature complex, multi-scale void systems that promote biodiversity and enable marine organism colonisation, presenting an ecological alternative to traditional materials such as

concrete and steel. With a budget of €1,972,235.56, 3DPARE sought to demonstrate the ecological and functional advantages of these tailored reefs over conventional structures. Co-financed by the European Regional Development Fund through the Interreg Atlantic Area Programme, the project aimed to foster a sustainable solution to marine habitat loss while supporting economic and recreational needs.

A-AAGORA

The A-AAGORA project (Atlantic-Arctic Agora) was a Horizon Europe-funded project focusing on restoring and protecting marine and coastal ecosystems in the Atlantic-Arctic region, with a strong emphasis on building resilience to climate change. With a budget of €9.8 million and a duration from 2022 to 2026, A-AAGORA was aligned with the European Commission's mission to "Restore Our Ocean and Waters by 2030." It aimed to address critical environmental pressures through Ecosystem-based Management (EBM) and Nature-based Solutions (NbS). By implementing three demonstration sites in Portugal, Ireland, and Norway, the project sought to mitigate climate impacts by fostering community engagement and providing scalable models for ecosystem restoration.
Key project goals included reducing pollution, enhancing biodiversity, and supporting a sustainable blue economy. The demonstration sites were intended to serve as testing grounds for innovative ecological interventions such as blue reforestation and habitat restoration, producing data and strategies to guide global ocean science and conservation efforts. Ultimately, A-AAGORA's collaboration with local stakeholders and digital knowledge-sharing platforms was designed to support sustainable, nature-based coastal resilience across the Atlantic-Arctic basin, while fostering public and governmental support for long-term environmental stewardship.

CLIMAREST

The CLIMAREST project (Coastal Climate Resilience and Marine Restoration Tools for the Arctic Atlantic Basin) was a Horizon Europe-funded project focusing on enhancing climate resilience through the restoration of diverse marine and coastal ecosystems along the Arctic-Atlantic corridor. Running from 2022 to 2025 with a budget of €8.5 million, CLIMAREST operated across five demonstration sites spanning from Svalbard in the Arctic to Madeira in the southern Atlantic. The project developed an innovative "toolbox" to standardise restoration practices, offering solutions tailored to vulnerable habitats, including Arctic fjords, Oyster reefs, seagrass meadows, rocky substrates, and sedimentary soft-bed ecosystems, considered critical for biodiversity and climate resilience. Using a holistic, transdisciplinary approach, CLIMAREST prioritised community engagement, local knowledge integration, and scalable restoration techniques. Its toolbox included methodologies for ecosystem-service improvement analysis, cost-benefit assessments, and third-party data integration, all aimed at bridging gaps between research and real-world restoration practices. The project aligned with the EU's Mission "Restore our Ocean and Waters by 2030" and collaborated with projects like BlueMissionAA to foster sustainable governance and policy transformation, ultimately supporting the EU's Green Deal goals for a resilient marine environment.

REST-COAST

The REST-COAST project aimed to upscale coastal ecosystem restoration to support climate adaptation and biodiversity gains across Europe's vulnerable coastal systems, including estuaries, deltas, and coastal lagoons. With €17.8 million in EU funding, REST-COAST employed nature-based solutions (NbS) to reduce the carbon footprint of coastal adaptation, replacing traditional high-impact infrastructures with biodiverse, resilient habitats. Working across nine pilot sites, the project integrated new restoration techniques, financial mechanisms, and governance structures to ensure long-term sustainability and risk reduction in these regions. A significant focus was on enabling scalable restoration pathways and digital tools to inform management decisions under varying climate scenarios, further contributing to the EU Green Deal's climate mitigation goals.

RESTORESEAS

The RESTORESEAS project focused on restoring seagrass ecosystems, which played a critical role in carbon sequestration and biodiversity conservation in marine environments. This project implemented restoration strategies that included developing genetically diverse seagrass meadows resilient to environmental changes and promoting ecosystem services like habitat provision for marine species and carbon storage. RESTORESEAS collaborated with local stakeholders to ensure sustainable practices and benefits for coastal communities, which emphasised the importance of marine ecosystems in the face of climate change.

THAMES21

THAMES21 was a London-based environmental organisation dedicated to restoring and maintaining the health of the River Thames and its tributaries. As such, it differed from the other case studies above ipso facto. Through community engagement, educational programs, and hands-on restoration activities, THAMES21 addressed pollution, promoted biodiversity, and supported flood resilience. Its initiatives involved extensive citizen science efforts, enabling local volunteers to monitor water quality and participate in conservation projects, fostering public stewardship of urban waterways. THAMES21 was recognised for its impact on urban river health and its role in empowering communities to address environmental challenges at a local level.

Description of information sought from project studies.

The above-mentioned project case studies were consulted directly and requested to provide the relevant input on the below information.

Project: The name or acronym of the project.

Website: A link to the project's main website, providing stakeholders and the public with detailed, accessible information about the project's activities, objectives, and partners.

Objectives/Key Words: A concise description of the project's main goals and thematic focus, capturing its purpose and key areas of study. Keywords help quickly classify the project for searches and categorization.

Lead/Coordinator: The lead institution or individual primarily responsible for leading the project. This provides insight into the primary driver of the project's implementation and coordination.

Contact Email, Phone: Contact details for the project lead or key personnel. This allows the BlueMissionAA team, and external actors to directly reach the appropriate team for inquiries.

Location and Sites: Details on the physical locations and specific sites where project activities have been conducted. This information helps contextualise the project within particular ecosystems or communities.

Ecosystem Types: The types of ecosystems (e.g., coastal habitats, harbours/bays, wetlands, marine) that the project targets, clarifying the environmental focus and areas of ecological relevance.

Restoration Approaches Studied: A description of the restoration methods being applied, such as habitat improvement, seeding, or predator removal. This indicates the project's approach to achieving ecological restoration goals.

Restoration Successes (Yes/No): Indicates whether the project has achieved any identifiable restoration successes, providing an initial indicator of the project's effectiveness.

Indices Used to Gauge Restoration Success: Lists any quantitative or qualitative metrics used to assess restoration success, such as survival rates, biodiversity indices, or carbon sequestration. This information shows how project outcomes are measured scientifically.

Social Metrics Used to Gauge Success: Lists any social factors evaluated, such as community well-being or stakeholder satisfaction, to assess how the project impacts local communities and social outcomes.

Long-Term Monitoring: Describes any ongoing monitoring of physical, ecological, or community factors used to assess long-term project impacts. This information provides insight into commitment to sustained outcome evaluation.

Community Participation/Citizen Science: Indicates whether the project involves local community members or uses citizen science methods, showing the level of public engagement and collaborative research.

Regulatory Challenges/Successes: Any legal or policy-related obstacles encountered or successes achieved, helping assess regulatory support and barriers in project implementation.

Number of Scientific Papers on Restoration Approaches Published: The quantity of academic publications resulting from the project, reflecting its contribution to scientific knowledge and sharing of best practices.

Number of Policy Reports Published: The number of policy-related reports published, underscoring the project's efforts to inform or influence policy.

Number of Science-Policy Presentations Given: The number of presentations targeting both scientific and policy audiences, showing the project's outreach in bridging science and policy.

Number of Scientific Presentations Given: The number of academic or professional presentations delivered, indicating efforts to disseminate findings within the scientific community.

Resulting Private/Public Investment: Details any investments made as a result of the project's restoration activities, highlighting economic or funding impacts directly tied to project outcomes.

Website and Social Media Viewing Metrics: Statistics on website visits and social media engagement, showing the project's reach and public interest.

Project Partners: A list of partner organizations or a link to partner details on the website, showing collaboration and the project's network.

Schedule: Planned start and end dates, giving insight into the project's timeline and duration.

Status: Indicates if the project is ongoing or completed, clarifying its stage in the project lifecycle.

Funding: The funding source or scheme supporting the project, which contextualizes the project's financial backing.

Type of Project: Identifies the project's classification, such as research, innovation, or support, helping clarify its purpose and scope within a broader funding program.

Comments: A space for additional notes or relevant information that doesn't fit into other predefined categories, allowing for flexibility in reporting unique or unexpected project details.

3. Results and Discussion

This discussion is based on the results of the questionnaire (Appendix A) and is thus a report on the subjective responses of the project participants. The projects are evaluated at the community level, with no direct reference or critique of individual projects.

The projects selected by WP1 represented restoration activities from the Arctic to the Southern tip of Atlantic Europe, South America and West Africa. The projects encompassed

ecosystems found in rivers and river catchments, harbours and bays, and more open coastal ecosystems.

The projects covered a wide range of restoration approaches, including the indirect methods habitat improvement through wastewater treatment, ecosystem-based management, eco-engineering through artificial reef provision, and direct methods including transplantation, seeding, grazer and predator removal.

Restoration success was only reported by one project. Other projects reported that monitoring was underway. There was no common approach to the metrics being used to evaluate success. Biodiversity indices were reported but traits varied amongst the approaches and included, e.g., species diversity, community composition, quantities, and concentration. The wide variety of reporting indices made standardisation challenging. This challenge is further enhanced via data gaps on ecosystem resilience and long-term impacts, hindering a full evaluation of restoration outcomes. This is illustrated by most of the projects' self-reported evaluation stage as 'ongoing' due to the projects' young age.

Social metrics to gauge success were reported by four projects, ranging from community involvement and citizen awareness through to a dedicated work package dedicated to governance. Community participation was recognised as an important driver of successful restoration, however, measuring the impact meets challenges due to differing documentation between the projects.

When approaching opportunities for increasing scale, projects reported already having challenges with licensing for small-scale restoration activities and two projects reported investment at local scales. Regulatory barriers were mentioned as obstacles to scaling up restoration efforts. No study reported that there was investment other than the public funding of the project. Without data on long-term financial sustainability limited the understanding of the projects' persistence post-grant funding. The combination of regulatory and financial barriers reported by the projects can be identified as structural barriers for Mission implementation. This is further enhanced by limited documentation on how different regulatory environments influence project success. Data gaps on policy engagement and regulatory approvals prevent deeper insights into governance challenges, hinting at a potentially valuable research desideratum with the potential of increasing Mission implementation efficiency if current uncertainties are cleared.

Scientific publications and presentations reported were low, but this represents the immaturity of the projects, and it is expected that this will increase substantially, with time. Similarly, it takes time to integrate the activities and results into policy advice. Website and social media metrics, where evaluated, showed that the projects are reaching out to a wide audience. Still, due to limited data based in the identified immaturity, the effectiveness of transforming knowledge sharing and outreach into policy advice cannot be finally determined at this stage.

4. Conclusion

The projects chosen as case studies in WP1 are strong examples of restoration activities within the Atlantic and Arctic lighthouse region. They cover a multitude of restoration approaches. However, as all are recent or on-going restoration activities, they do not have the maturity to fully evaluate success. With such young projects, this delivery provides an evaluation of their potential, while recognising the need for long-term monitoring and assessment to determine actual impact.

Similarly, no common framework for determining the success of restoration was found, with significant gaps in reporting under the selected indicators. Within the theory of change, the projects are very much at the activity stage, with some indication of outputs. However, the outputs, and certainly the pathways to impacts at the ecosystem and social levels, require more long-term investment to determine if the restoration approaches are successful and upscalable.

This study has provided a good evaluation of metrics to be integrated downstream within the BlueMissionAA project and through the wider Mission restoration approach. It highlights the need and opportunity to establish more realistic indicators of restoration success to guide effort and reporting of strategies for restoration activities that deliver the Mission ambition.

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Project website main directories

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A-AAGORA: https://a-aagora.eu/, last visited 31 January 2025.

CLIMAREST: https://climarest.eu/, last visited 31 January 2025; https://www.sintef.no/en/projects/2023/climarest/ , last visited 31 January 2025.

REST-COAST: https://rest-coast.eu/ , last visited 31 January 2025.

RESTORESEAS: https://www.restoreseas.net/, last visited 31 January 2025.

THAMES21: https://www.thames21.org.uk/, last visited 31 January 2025.

Appendix A


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