

The Adriatic Ecological Observing System (ECOAdS): structure and future perspectives within the main European and global biodiversity strategies

Aim of the document

The main aim of this document is to present the **Adriatic Ecological Observing System (ECOAdS)**, whose design and first steps for establishment have been carried out within the Interreg Italy-Croatia Project ECOS (ECOLOGical Observing System in the Adriatic Sea: oceanographic observations for biodiversity), and to propose some perspectives for its medium- and long-term maintenance.

After a short definition of Marine Ecological Observatories and their main features, we describe the current structure of **ECOAdS**, its main components and its potential relevance in relation to the main European and global strategies for biodiversity and for marine observation for the next decade.

Finally, we suggest some steps that could be undertaken for the ECOAdS future development, offering some perspectives in different macro-regional, national and European strategic contexts.

Summary

- **ECOAdS** integrates, for the first time in the area, the ecological and oceanographic dimensions with the protection strategies of the **Natura 2000** (N2K) marine sites, evidencing gaps and needs.
- **ECOAdS** contributes to the harmonization of monitoring schemes, data acquisition and analysis at national and trans-regional levels, providing suggestions for a most effective and coordinated application of the **EU directives** (HBD, WFD, MSFD, MSPD)
- **ECOAdS** concretely supports the coherent management and monitoring plans of both existing and future marine N2K sites, thus potentially becoming a **decision-support tool** for governance and management.
- **ECOAdS**, through its **web portal**, makes available data and information, tools and facilities for local, regional and national public authorities, managers of protected areas and N2K sites, education and research organizations.
- **ECOAdS** functions as a **cooperation bridge** between Italy and Croatia, building a cross-boundary ecosystem-based marine knowledge framework, which could be expanded to the whole Adriatic region, using the policy and financing tools available in the area.
- **ECOAdS** could serve as a coordinated and co-located platform serving different European Environmental Research Infrastructures, sustaining the components that are under development in the Adriatic area.
- **ECOAdS** is in line with plans and strategies for the next decade, at the national, macro-regional (e.g. EUSAIR) European (e.g. EU Biodiversity Strategy for 2030, the European Green Deal) and global levels (e.g. the Global and European Ocean Observing Systems, the Ocean Decade) and might therefore contribute to their fulfilment. This is particularly relevant within the national recovery plans, following the COVID crisis, which necessarily include investments for the restoration and protection of the marine ecosystems.

1. Marine Ecological Observatories: the background of ECOAdS

- Marine Observatories (MOs) are globally widespread as observing and experimenting infrastructures necessary to collect high-resolution oceanographic data in selected marine regions, both in coastal and offshore areas, in order to assess their state and modifications due to human- and climate-induced changes.
- MOs are crucial for producing knowledge and supporting evidence-based decisions addressed towards ocean management. To be effective, MOs are requested to adopt a holistic view of the marine ecosystems, including biological and ecological processes, which are intrinsically entangled with the oceanographic ones.
- **Marine Ecological Observatories (MEOs)** incorporate this approach and represent a further advancement of the MOs perspective. They broaden the spectrum of marine observations, arranging and maintaining harmonized and coherent long-term observations and linking oceanographic and ecological monitoring with the effectiveness of the protection and restoration measures.
- MEOs entail the **ecological connectivity concept**, which is one of the main driving forces of marine ecosystems' functioning, embracing the complex interconnections among natural processes, species, life cycles, and environment.
- MEOs should be platforms able to generate knowledge on the dynamics that vitally interconnect the human dimension and the natural systems. They should involve researchers, policy makers and the civil society to collect a **variety of knowledge** and viewpoints and to favour innovation and development in information creation and management at the proper spatial scales.
- According to this view, MEOs should incorporate the following essential attributes, which we developed in **ECOAdS**:
 - **Agreed conceptual framework** for the harmonization of monitoring schemes, data acquisition and analysis at national and trans-regional levels – The framework is based on assessed criteria and selected environmental monitoring indicators, recognized for being adequate to describe the state of the marine environment, coherently with the EU legislative requirements and to support global frameworks (i.e., the Essential Biodiversity Variables and the Essential Ocean Variables).
 - **Adoption of the Open Science approach** - Data platforms to deliver oceanographic and ecological information should create the conditions for the exchange of knowledge among scientists, decision-makers and citizens, enhancing the transformation of a typical top-down flow of information into a multi-players dialogue.
 - **Cooperation among the fragmented multi-level governance** - MEOs should inform policies and strategies dealing with marine protection, planning and management, at multiple spatial scales, harmonizing and creating synergies among all the different jurisdictional instruments.
 - **Knowledge co-production** - MEOs recognize the role of multiple knowledge sources, by entailing local and traditional knowledge and directly engaging local communities as part of the observatory system itself and support its governance and management system.

2. ECOAdS: the Adriatic Ecological Observing System

- The Adriatic Ecological Observing System **ECOAdS** is the main outcome of the Interreg Italy-Croatia project ECOS, which involved 10 partners from Italy and Croatia and lasted 30 months (01/01/19-30/06/21).
- ECOAdS integrates the existing ecological and oceanographic research monitoring with **Natura 2000** (N2K) protection strategy in the Adriatic Sea, focusing on the area under the jurisdiction of Italy and Croatia, thus contributing to the protection status of N2K habitats and species, especially for those sites that lack management and monitoring plans, which are the majority.
- With the aim to realize the four main MEOs attributes, ECOAdS includes and is based on six main components:
 1. **The existing facilities, infrastructures and data resources** in the area - A thorough inventory has been made available, evidencing major strengths, weaknesses and gaps.
 2. **The Natura 2000 sites** - Six N2K sites have been considered as case studies, to assess their environmental status, the management level and priorities, the socio-economic contribution to local activities, and the existent monitoring activities.
 3. **The conceptual model** - A unique scheme has been developed, highlighting the key role of ECOAdS for linking the socio-ecological and oceanographic dimensions with the protection of the coastal and marine environment and its management.
 4. **The Directives harmonization** - ECOAdS has been tested as a monitoring platform that may respond and contribute to the requirements of the main EU directives (HBD, WFD, MSFD and MSPD), harmonizing and optimizing the existing monitoring and management frameworks.
 5. **The stakeholder involvement** - A participatory process has started, aimed at including a plurality of voices and a wide range of knowledge, together with that derived from scientific communities and methods.
 6. **The web portal** - The ECOAdS web portal has been created, providing relevant information, data tools and services to a wide stakeholder community.

3. ECOAdS in the wider frame of European and global strategies and research Infrastructures

- ECOAdS may contribute effectively to the fulfilment of relevant macro-regional, European and global strategies and programmes for the next decade:
 - The **EU Strategy for the Adriatic and Ionian Region (EUSAIR)**, which aims to create synergies and foster coordination among all territories in the Adriatic-Ionian Region. The EUSAIR 2021-2027 strategic plan proposes a list of “Flagships” for each thematic pillar, which addresses the main challenges of macro-regional importance consistent with national needs and EU policy objectives for a greener, low-carbon and more connected Europe. Pillar 3 “Environmental quality” includes the Flagship “Promotion of sustainable growth of the Adriatic Ionian region by implementing ICZM and MSP also to contribute CRF on ICZM of Barcelona Convention and the monitoring and management of marine protected area”, which aims at (i) promoting sustainable development and facilitate adoption of coastal and maritime spatial plans (MSPD, ICZM Protocol) by defining gaps in marine and coastal knowledge, (ii) identifying conflicts and propose sustainable options for action,

- (iii) helping the management of natural, social, economic and spatial assets in Adriatic-Ionian region, (iv) serving as indicators of the GES of marine waters of the Adriatic and Ionian Seas.
- The **EU Biodiversity strategy for 2030**, which states the need of improving and widening the network of protected areas and developing an EU Nature Restoration Plan. The enlargement of protected areas in marine ecosystems should attain the 30% of the EU Seas and a 10% should be strictly protected. The designation of new protected areas helps to complete the N2K network and the national protection strategies, with clearly defined protection objectives and measures. Beside this, the EU Nature Restoration Plan foresees the restoration of marine ecosystems, through the application of the ecosystem-based management approach.
 - The **BlueMed initiative**. The BlueMed Implementation Plan provides a medium-term operational tool to develop sustainable Blue Economy in the Mediterranean area, supporting the development of an observing system of systems in the Mediterranean, able to better understand the complex marine ecosystem and its functioning, to measure and assess its evolution under different stressors, and to manage resources sustainably.
 - The **Global Ocean Observing System (GOOS) 2030 strategy** and the **European Ocean Observing System (EOOS) implementation plan**, which call for a step change in ocean observing to a fully integrated global observing system, able to capture essential physical, chemical, biological, and ecological ocean properties, from global/EU to local and coastal scales, mapping existing ocean observing infrastructures and capabilities related to biological observing networks.
 - The **Implementation Plan for the UN Decade of Ocean Science for Sustainable Development (Ocean Decade, OD) 2021-2030**, which aims at facilitating a paradigm shift in the design and delivery of qualitative and quantitative ocean knowledge to inform solutions that will contribute to the 2030 Agenda for Sustainable Development.

4. ECOAdS perspectives after the project ECOS

- The medium- and long-term sustainability of ECOAdS could find its realization within the above-mentioned contexts, through the creation of efficient collaborations, transparent data sharing, and maximum effort to minimize the duplication of activities, facilitating as well financial issues. Here we individuate some possibilities—among the many and various—that could be undertaken in the short- and medium-term, at the national and Adriatic level. Besides, we address also the technological issues and delineate the main narrative that should keep inspiring the development of ECOAdS.
 - The overall ECOAdS framework, the action plans proposed for the monitoring and management of the N2K sites, and the web portal, could contribute to a most effective and coordinated application of the directives (HBD, WFD, MSFD, MSPD) at the **national and regional/country level** in the two Countries. Within the context of the ministerial and regional/country policies, the outcomes and the development of ECOAdS could find a proper governance and management, as well as financial support.
 - The development of synergies with other **Interreg Italy-Croatia** projects, at different stages of their advancement, could allow linking also their relevant results to the ECOAdS web portal and creating future joint actions and projects, thus enhancing the capitalization of the outcomes in the two Countries.

- The main components and attributes of ECOAdS could be applied to the wider **Adriatic macro-region**, using the policy and financing tools available in the area (e.g. Interreg ADRION, EUSAIR). The Adriatic could, in this way, become an exemplary case study for the whole Mediterranean Sea and beyond, also in agreement with the **BlueMed** Implementation Plan.
- Many **Environmental Research Infrastructures** (RIs), included in the European and national RIs roadmaps, although at different stages of their development, are active in the Adriatic Region (e.g. Danubius RI eLTER RI, EMBRC-ERIC, ICOS ERIC, JERICO S3, LifeWatch ERIC). ECOAdS could rely on, contribute to, and benefit from these RIs, sustaining those RIs' components that are under development in the Adriatic area. The RIs will be relevant for the long-term maintenance and financial sustainability of ECOAdS, in particular if a joint collaboration among them, which is required and arising at the national and EU level, will be realized. ECOAdS could represent the opportunity to boost such collaboration in the Adriatic Sea, by representing and developing a co-located system with shared research and monitoring tasks allowing modular and multi-purpose uses.
- The **technological development** and the involvement of SMEs, not addressed during ECOS, should be necessarily included for the future development of ECOAdS, embracing and leveraging the emerging technologies, thus enhancing cross-border collaboration between science and the private sectors. ECOAdS could be the suitable platform for developing and testing innovative in situ technologies (e.g. from chemical, imaging, acoustic, and molecular sensors to robotic platforms) and for the improvement of data storage, data discovery, computation capabilities and modelling, which might enable novel ecological syntheses. This will be in line with the action plan of the European Green Deal, by investing in environmental-friendly technologies and supporting industry to innovate, sustaining the legally binding nature-restoration targets.
- Finally, ECOAdS should entail the ultimate aim to unlock from old habits, contributing to a **shift in our way of living** and a profound transformation of our socio-economic systems. As stated in the EU biodiversity strategy for 2030 "protecting and restoring nature will need more than regulation alone. It will require action by citizens, businesses, social partners and the research and knowledge community, as well as strong partnerships between local, regional, national and European level." To this respect, ecological research within ECOAdS is called to become "Action Ecology", i.e. (i) collaborative and transdisciplinary, able to incorporate sociological into ecological researches, (ii) innovative and aggregative, relying on large datasets and rapid synthesis for theory testing and development, (iii) designed and realized with the intention to inform policy and management, providing immediate and effective insights into current, pressing issues. Moreover, to effectively contribute to the necessary cultural shift, ECOAdS should incorporate into its plans a new narrative, where Nature protection and restoration shall not be a strategic specialty within our economic system, rather become an **ethical challenge and transformation**, moved by the ultimate goal to attain the health and durability of human and natural communities, instead of profits.



This document has been drafted and agreed by the whole ECOSSE partnership

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