ECOlogical observing System in the Adriatic Sea: oceanographic observations for biodiversity

Priority Axis 3: Environment and cultural heritage

Specific Objective 3.2: Contribute to protect and restore biodiversity

D5.2.1 ECOSS Web Data Portal

WP5 – Design and implementation of data infrastructure

A5.2 – Implementation of the Data infrastructure

Project partner in charge / Authors: LP_CNR / Elisabeth De Maio, Stefano Menegon, Alessandro Sarretta, Alessandro Oggioni, Paolo Tagliolato, Elisabetta Manea, Caterina Bergami, Alessandra Pugnetti

Other involved partners: PP1 OGS, PP2 ARPAE, PP3 IOF, PP4 PARCO DELTA PO, PP5 BWI, PP6 PIDNIC, PP7 SEA&KARST, PP8 SHORELINE, PP9 CA FOSCARI

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Contents

1. INTRODUCTION

The ECOAdS Portal was developed and implemented during the Ecoss Project activities and will be further improved during the maintenance period.

The Data Portal aims at making available information and data relevant for the ECOlogical observing system in the Adriatic Sea, in short ECOAdS, with the goal of supporting and informing the conservation of the Natura 2000 Network in the Adriatic Sea. Various information, data, observing systems, web platforms and portals already exist dealing with elements of relevance for marine conservation purposes and Natura 2000 sites. The ECOAdS Data Portal is not meant to substitute these resources, but instead it builds upon them and capitalizes all relevant experiences.

This document provides references and links to the online implementation of the ECOAdS Data Portal, an overview of the software architecture and a brief description of the main data portal components. Finally, the last section provides references and links to the online repository where developed software has been released under an open source license.

2. ECOAdS REQUIREMENTS AND ARCHITECTURE

Description on data availability, existing infrastructure and partners' expectations on ECOAdS Data Portal are presented in the deliverable "D5.1.1 Report on data/information availability and infrastructure/tools".

Following the indications provided by the previous deliverable, a detailed analysis has been carried out to identify the architecture of the Data Portal, including identification of expected users, data portal functionalities and interactions/data workflows with the data providers. In addition, three stakeholder engagement meetings and four project meetings were organized alongside the design and development stages to ensure that end-user expectations about the Data Portal functionalities and the data and information it contains were met.

The ECOAdS Data Portal overall architecture is presented in Figure 1. The three main components of the architecture (End-users, Functionalities and Data Providers) are briefly described in the following sections.
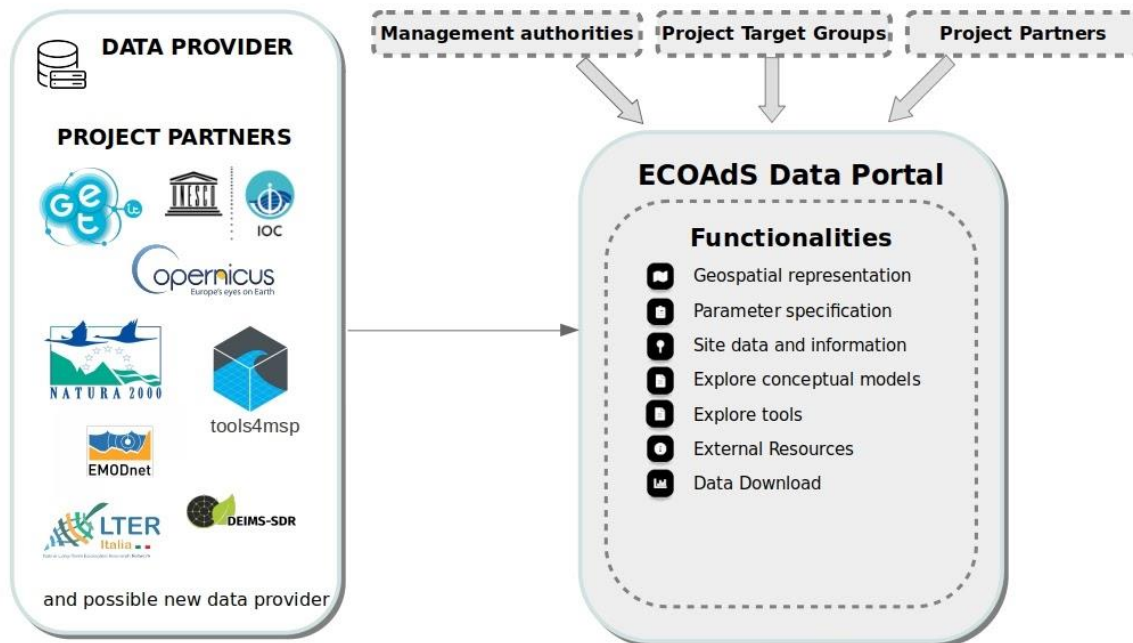

Figure 1. Overall architecture of the ECOAdS Data Portal infrastructure.

2.1 ECOAdS End-users

Four main users groups have been identified:

1. ECOAdS management authorities: Managers of Protected Areas, Monitoring Programmes and LTER and Natura 2000 sites, natural heritage management bodies.

    - Data and information needs:

- access to available (and relevant) data and information in order to fulfil the directives' obligations (e.g. MSFD, WFD)

- merge observatory internal and external data

- containing lists of parameters for each directive

- monitoring stations locations, metadata

- data download

2. Universities and research institutes: e.g. biologists, ecologists, coastal and maritime planners.

- Data and information needs:

  - access to updated and valuable ecological information including data on main anthropogenic threats

  - data download

3. Local, regional and national public authorities

- Data and information needs:

  - LTER and Natura 2000 sites

  - monitoring stations locations, metadata

  - data download

4. Education and training organizations

- Data and information needs:

  - LTER and Natura 2000 sites

  - access to available (and relevant) data and information

2.2 Functionalities

The following functionalities have been developed and implemented.

1. Geospatial representation of the observatory: presenting location of LTER sites, Natura 2000 sites and Fixed Point Observing Systems.

2. Access to site data and information: presenting detailed information (metadata) about the ECOAdS sites (e.g. denomination, description, domain area, management authorities, external reference), linkage to monitored parameters and linkages with additional information resources (e.g. conceptual models, measurements, tools, maps).

3. Preview and access to external resources.

4. Explore and download time-series data of monitored parameters.

5. Explore target species and ecological processes relationships (conceptual models and ECOAdS tools).

6. Explore and download geospatial information.

2.3 Data Providers

The ECOAdS Data Portal is not intended to directly archive and manage time-series, geospatial datasets or other datasets of ecological interest but it's intended to mashup and facilitate access to external resources avoiding data duplication. The main external data providers are:

- ECOAdS project partners: data and information on existing monitoring programs.
- DEIMS-SDR (Dynamic Ecological Information Management System): information and metadata related to ecosystem resource sites for the Adriatic-Ionian region. https://deims.org
- Natura 2000 sites network: information on physical, chemical and biological parameters. https://natura2000.eea.europa.eu/

- Semantic Data Service of the European Environment Agency: https://semantic.eea.europa.eu/
- IOC - Sea Level Station Monitoring Facility: sea level time-series acquired by Italian and Croatian monitoring stations in the Adriatic Sea. http://www.ioc-sealevelmonitoring.org/
- CMEMS - Copernicus Marine Service - Mediterranean Sea Physics Reanalysis: provides free and open marine data. https://marine.copernicus.eu/
- EMODnet Bathymetry - European Marine Observation and Data Network: provides a service for viewing a harmonised Digital Terrain Model. https://www.emodnet-bathymetry.eu/
- CNR-ISMAR Tools4MSP: dynamic maps on anthropogenic uses and other Maritime Spatial Planning information in the Adriatic Sea http://data.tools4msp.eu/
- EcoNAOS Observatory: data and information on long term ecological marine database and time-series. Data is published through the VESK infrastructure. http://vesk.ve.ismar.cnr.it/

3. ECOAdS IMPLEMENTATION AND COMPONENTS

The ECOAdS Data Portal is currently hosted by the ISMAR-Venice Data Center and is publicly available at https://ecoads.eu/.
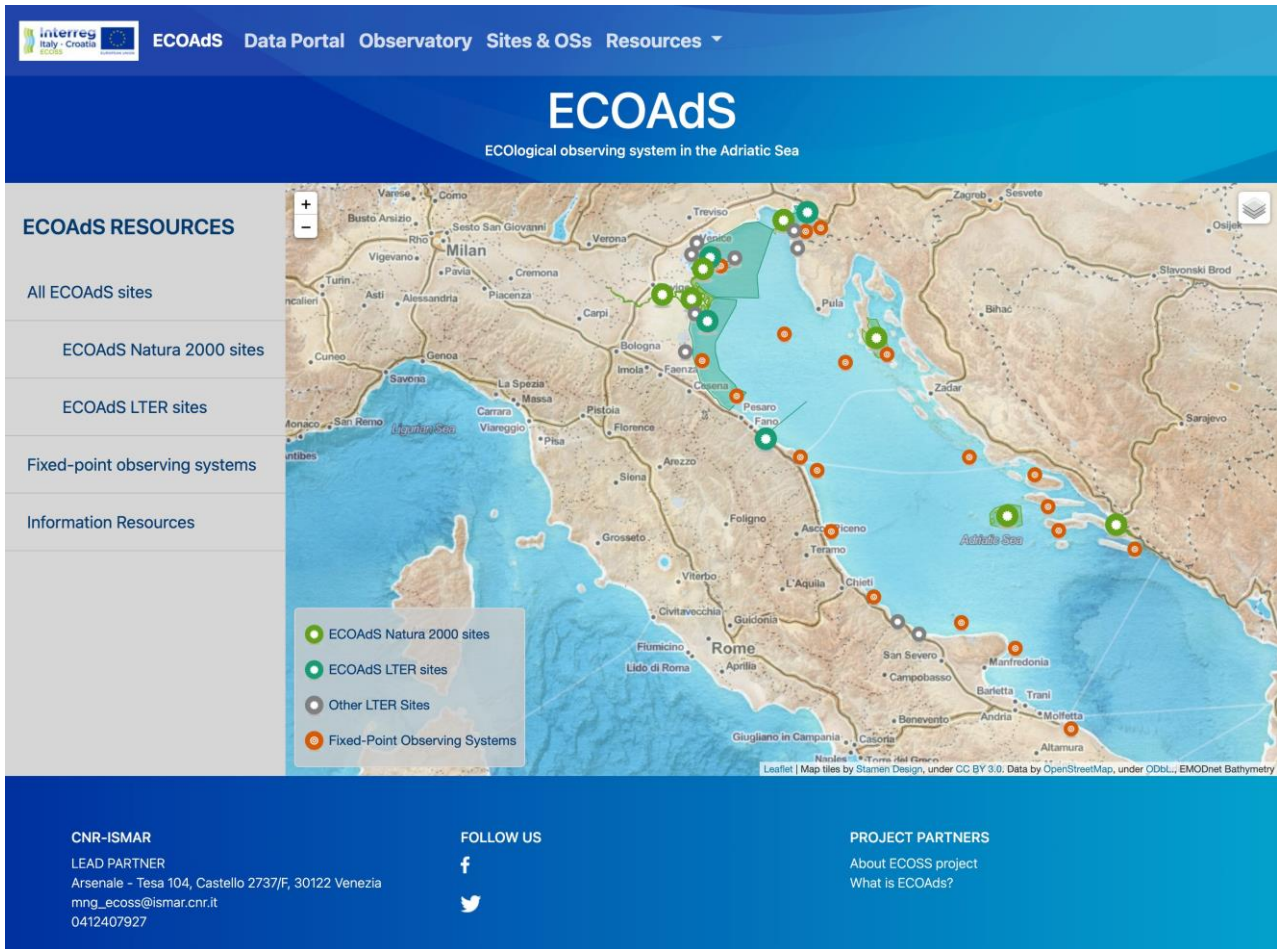
Figure 2. ECOAdS homepage.

In the following paragraphs the main components/sections of the ECOAdS Data Portal are presented.

3.1 Maps

The ECOAdS graphical user interface consists of a map (Figure 2) located on the homepage. The Map shows all the diverse research and monitoring sites incorporated by ECOAdS, those belonging to the Italian Long-Term Ecological Research Network (LTER-Italy) and to the Natura2000 network, and a number of fixed-point observing systems (i.e. pylons, buoys, tide gauges, oceanographic platforms). These latter provide multidisciplinary and automated monitoring of coastal and offshore marine environments, with high temporal resolution, for a number of marine and atmospheric variables. ECOAdS considers only the fixed-point observing systems and sites, located in the pilot study area and of which ECOSS partners are managers and/or direct scientific advisors.

- **ECOAdS Natura 2000 sites**

  Natura 2000 sites that provided case studies for the ECOSS Project. The Natura 2000 is a European Union wide network of nature protection areas designated as either Special Areas of Conservation or Special Protected Areas. The network stretches to all 27 EU countries, both on land and at sea. Natura 2000 sites are established for the protection of rare and threatened species, and some rare natural habitat types listed under both the Birds Directive and the Habitats Directive. Six Natura 2000 sites are considered in ECOSS as case studies.

- **ECOAdS LTER sites**

  LTER sites incorporated by ECOAdS. The Italian LTER network (LTER-Italy) involves many national scientific institutions, scientific societies and public agencies and includes 79 research sites that span the terrestrial, freshwater and marine domains, on which ecological research is conducted on a decadal scale. LTER-Italy is part of the European (LTER-Europe) and

International (ILTER) networks. The four LTER research sites in ECOAdS constitute the parent sites "Northern Adriatic Sea".

- **Other LTER Sites**

    Sites that are part of the LTER network and are located on the Adriatic coastal areas but are not part of the ECOSS Project.

- **Fixed-point observing systems**

    The fixed-point observing systems are pylons, buoys, tide gauges, oceanographic platforms, which operate at various spatial and temporal scales providing multidisciplinary and automated monitoring of coastal and offshore marine environments, with high temporal resolution, for a number of marine and atmospheric variables. They are managed by the main Research Bodies, Universities and Institutions that deal with marine research and monitoring.

3.2 Site Information

On the site detail page, for each site, there is a short description provided by <u>DEIMS-SDR</u> and several links to information and resources available for that specific site (Figure 3).

The Measurements and Information Resources sections will be explored in the paragraphs 3.3 and 3.4 respectively.

The tools are described in the deliverable D5.3.1 and the Conceptual Models part is extensively covered in the deliverable D3.3.1.

Figure 3. Detail page for Cres – Lošinj Natura 2000 site.

3.3 Measurements

The Measurements page allows, through interactive dashboards, the visualization and download of time series data for chemical and physical parameters. The dashboard is implemented by Grafana, an open source interactive visualization tool.
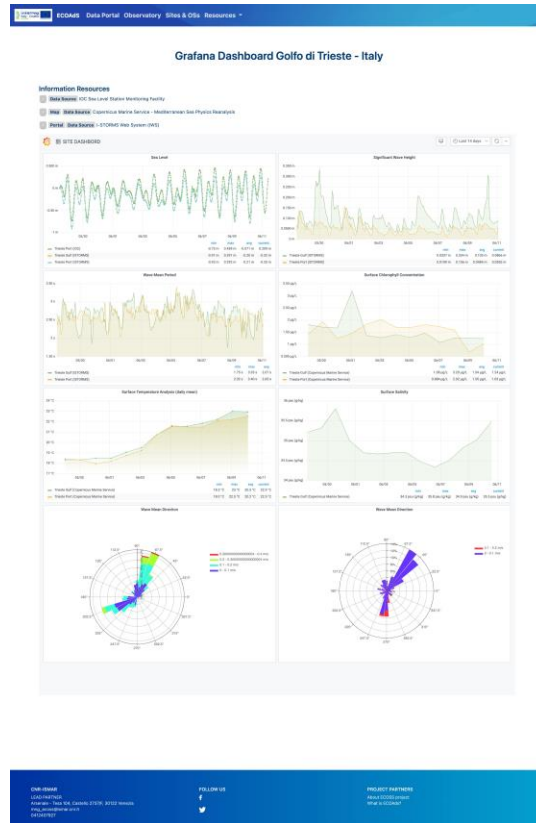
Figure 4. Measurements page for Golfo di Trieste site.

3.4 Information Resources

The Information Resources links provide connections with external ecologically-related information available for each ECOAdS Site. In this section all Portals, Maps, Datasets, ect., that provide relevant information for ECOAdS sites are collected.

Figure 5. Example of Information Resources. A map that reports anthropic uses in the Adriatic Sea created specifically for ECOAdS Portal.

3.5 Administration area

The administration area was designed to allow admin users to easily manage the links between objects in ECOAdS (ie. ECOAdS sites) with the external information resources (Figure 6).
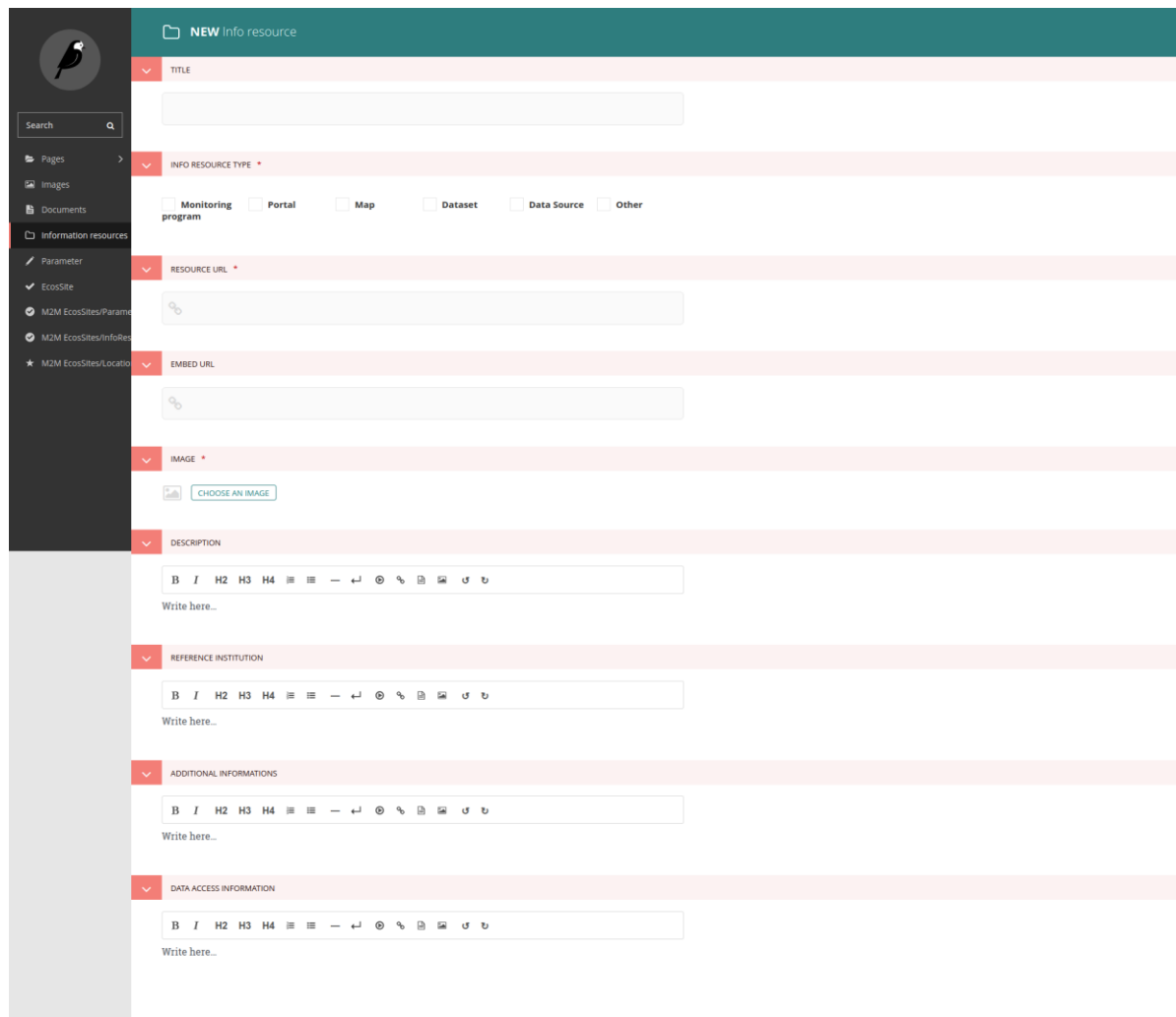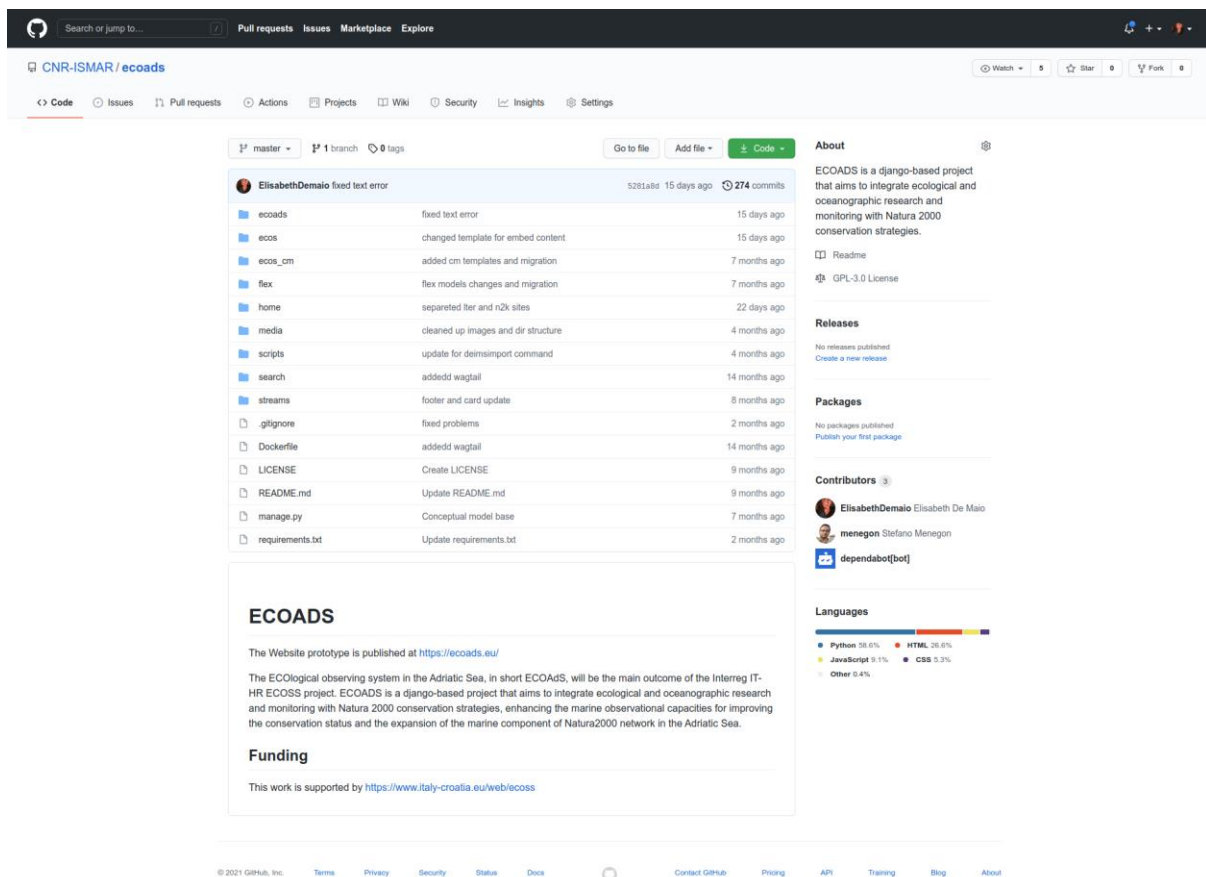

Figure 6. Administration GUI for adding a new Information Resource in ECOAdS.

4. PUBLIC CODE REPOSITORY

The ECOAdS software package is a Python-based open source software. All the source code developed within the ECOAdS project has been released under the GPL 3.0 license and is publicly available on a online GitHub repository: https://github.com/CNR-ISMAR/ecoads.

Figure 7. ECOAdS GitHub Repository.