Contribution of EMODNET Bathymetry Project to Marine Strategy Framework Directive (MSFD). Case of use: IEO

Olvido Tello [1], Dulce Mata [1], Alberto Cabezuelo [1], Gerardo Bruque [1], Luis M. Agudo [1]

[1] Spanish Institute of Oceanography (IEO) Corazón de María 8, 28002 Madrid, SPAIN

IMDIS 2021
Online, 12-14 April 2021
International Conference on Marine Data and Information Systems

EMODnet

European Marine Observation and Data Network

OBJECTIVES

EMODnet focuses in finding, collecting, harmonizing and standardizing the existing data on the marine environment, as well as to provide interoperability into the existing data and metadata. These data are accessible through Thematic Portals of EMODnet.

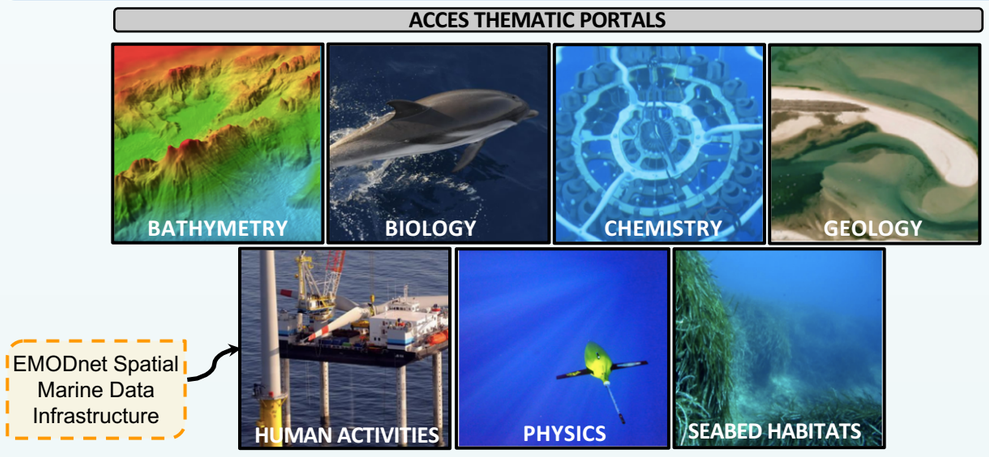

Fig. 1. Main access portals in the EMODnet webpage. Source: https://www.emodnet.eu/

To ensure sustainable growth and the conservation of biodiversity and marine resources →

EU INITIATIVES

- Integrated Maritime Policy
- Marine Strategy Framework
- Blue Growth
- INSPIRE
- Marine Spatial Planning

Regarding EMODnet Bathymetry, the main objective is to create a multi-resolution DTM with extended coverage including European zones. In the current development phase (2021-2022) the IEO in consortium are developing a DTM of ¼ of an arc minute, about 100 meters of resolution. Additionally, the satellite-derived bathymetry data contributes to cover the gaps in the coastal area. Moreover, a quality index is provided at the grid node level in order to inform the user about the quality of the DTMs.

Marine Strategy Framework Directive (MSFD)

OBJECTIVES

The MSFD aims to achieve Good Environmental Status (GES) of the EU's marine waters and to protect the resource base upon with marine-related economic and social activities depend.

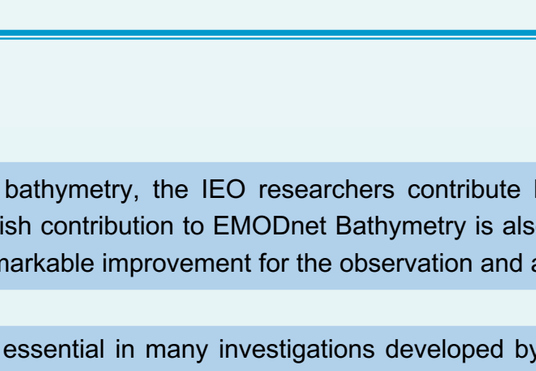

Fig. 2. MSFD Schema: Good Environment Status. Source: MITERD.

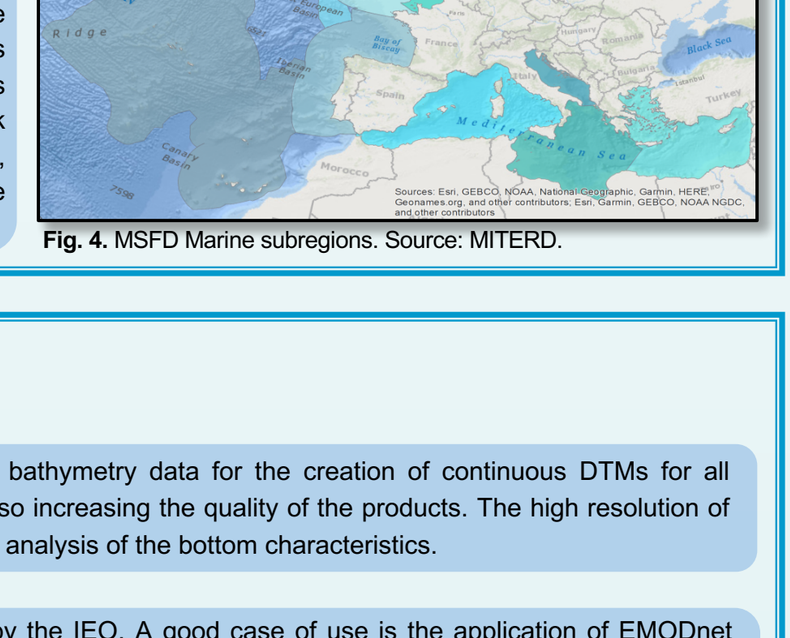

Fig. 3. MSFD Schema: descriptors. Source: MITERD.

In Spain, the Ministry of Ecological Transition and Demographic Challenge (MITERD) coordinates the MSFD, but the Spanish Institute of Oceanography (IEO) performs the research/study of the different indicators and therefore the tasks of collecting oceanographic data. This process is cyclical, thus the first cycle took place during the years 2012-2018 and, now, having started the second cycle (2018-2024).

Fig. 4. MSFD Marine subregions. Source: MITERD.

EMODnet Bathymetry and MSFD. Case of Use of IEO

All the data collected in EMODnet are essential for the researches of IEO to be able to have a spatial database of reference about the marine environment, to achieve the objectives of MSFD.

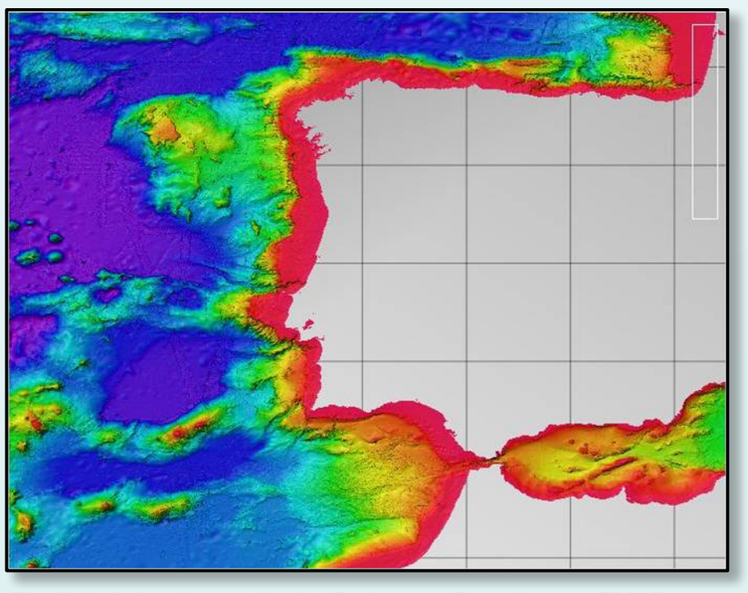

Fig. 5. Collation Status (Spain). Bathymetry Data. Source: EMODnet Bathymetry https://portal.emodnet-bathymetry.eu/

In the case of EMODnet bathymetry, the IEO researchers contribute bathymetry data for the creation of continuous DTMs for all European seas. The Spanish contribution to EMODnet Bathymetry is also increasing the quality of the products. The high resolution of the DTMs represents a remarkable improvement for the observation and analysis of the bottom characteristics.

The EMODnet DTMs are essential in many investigations developed by the IEO. A good case of use is the application of EMODnet DTMs in the studies of MSFD. The IEO is responsible of carrying out several monitoring programs of MSFD and the EMODnet Bathymetric models are also of vital importance in these monitoring programs, established for the different descriptors for continuous evaluation and periodic updating of the MSDF objectives.

For example, for the **Biodiversity Descriptor (D1)**, it is essential to know the depth of seabed, from the coastal zone to the depths of the sea. The distribution of marine habitats responds to bathymetric criteria, since it determines the existence of certain species and communities associated with different depth ranges. The assessment of D1 state is required at three main ecological levels: species, habitats and ecosystems.

In addition, taking bathymetric data as a source and supporting on existing spatial analysis tools in common GIS software, it is possible to obtain more practical information for the description of seabed. These tools use an analysis between the cells surrounding each one of them, obtaining patterns that offer us variables for the characterization of the seabed. Thus we get new information such as Hillshade, Slope, Aspect, Rugosity or exposure to the main current (see **Fig. 6**).

All these new parameters are fundamental for their introduction in the analysis for the generation of Species Distribution Models, Habitat Suitability Models and many other types of models for the study of marine biological diversity and its status environmental.

The EMODnet Bathymetric Model is also of vital importance in the **Sea-Floor Integrity Descriptor (D6)**, where the morphology and the type of the bottom is equally necessary for the analysis of indicators such as the loss of the seabed and the physical alteration of the bottom surface.

The DTMs are also used in the studies focused on others descriptors as D2. Non indigenous species; D4. Eutrophication; D8. Contaminants; D.11. Marine litter; D. 12 Underwater noise, inasmuch as the bathymetry is a variable which affects the processes that occur in each marine demarcation, related to these descriptors.

Conclusions:
The benefits obtained of using these DTMs in the investigations carry out in MSFD are many. Emphasizing, these models covering the entire surface of the marine demarcations. The resolution of 100 meters is enough to simulate process at demarcation scale. Besides, EMODnet bathymetry provide bathymetry of higher resolution (50, 25, 5 meters) in so-called "hot spot", very useful in detail studies.

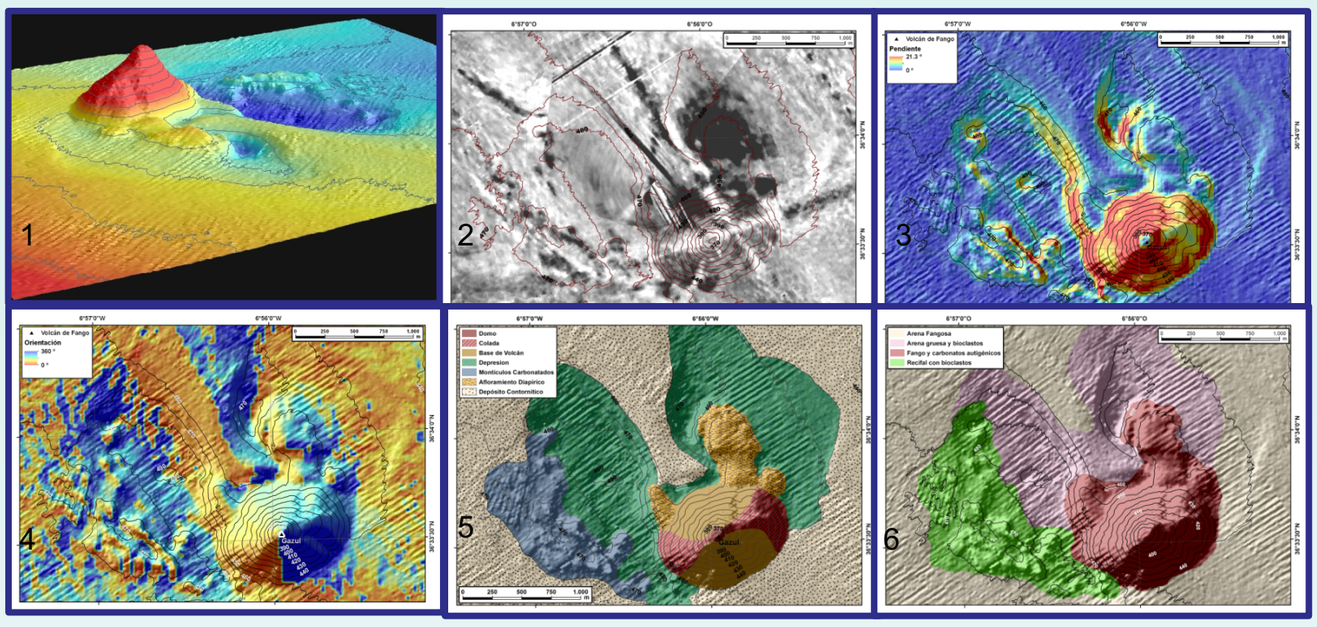

Fig. 6. Gazul Mud Volcano (Gulf of Cádiz, NE Atlantic). Example of thematic mapping sequence aimed at cataloging hábitats based on variables derived from bathymetric data.
1) DTM 3D; 2) Reflectivity; 3) Slope; 4) Aspect; 5) Sea-floor types; 6) Geomorphological Features
Source: IEO/GEMAR & INDEMARES project
https://www.indemares.es/sites/default/files/volcanes_de_fango_del_golfo_de_cadiz.pdf