CHAPTER 2

MED4EBM: Mediterranean Forum For Applied Ecosystem-Based Management

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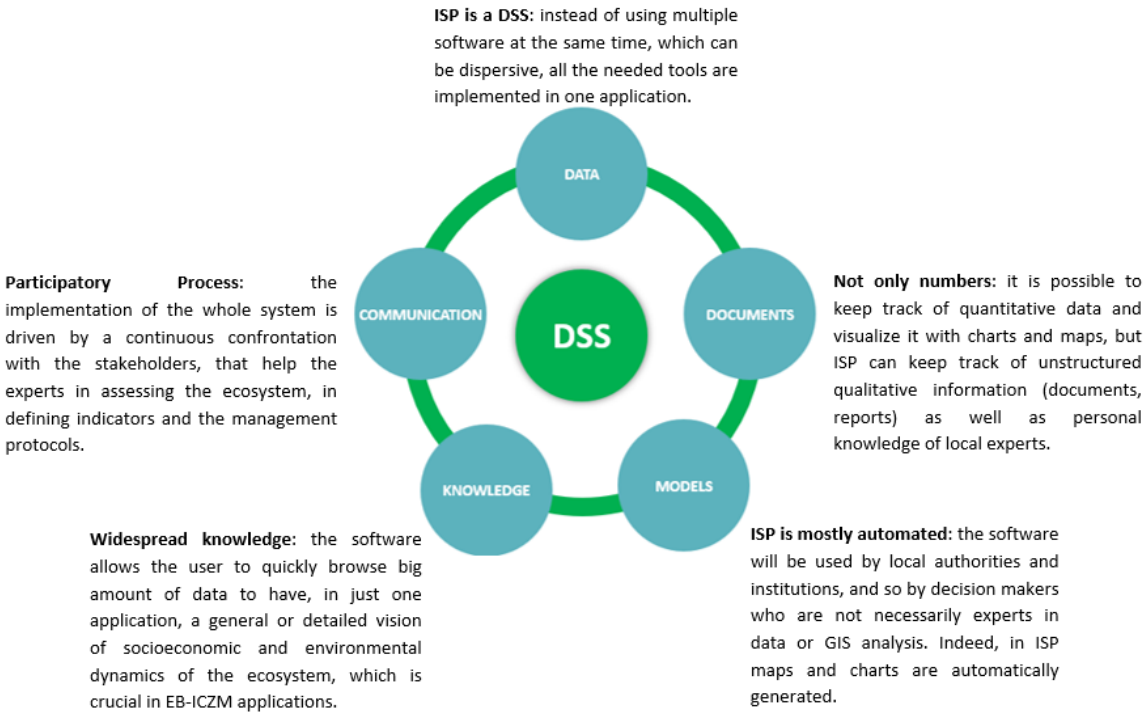
2.1 - Technologies and methodologies

The methodology applied included two categories of tools: a) a step-by-step process for the execution of multi-disciplinary environmental assessments and a software package, linked to b) a DSS software package, to support the ecosystem-based analysis of spatial and tabular datasets and the compilation of data-aware advanced reports. The name of the software package which MED4EBM is using is *Integrated Spatial Planning 4.0* (ISP40), a user-friendly Ms Windows application; it can be customized by non-professional users which need support in high-level decision makers and non-professional stakeholders (Figure 2.1).

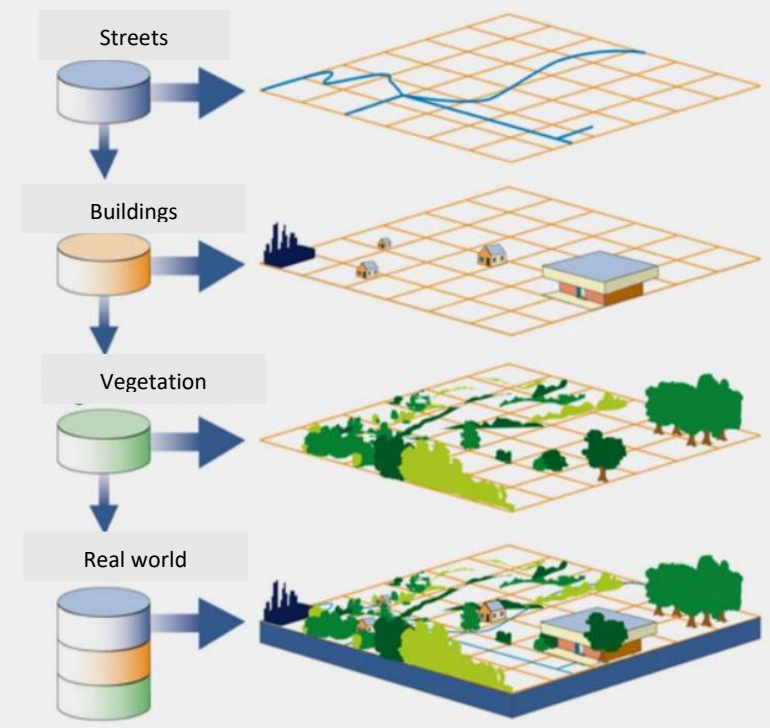
Figure 2.1
Main reasons why MED4EBM used ISP as DSS software package (figure M. Onori)



The ISP is aimed to implement several planning and management tasks, such as: Sustainable development; Environmental Based Management; Biodiversity conservation; Planning and management of protected areas; Rehabilitation and restoration of degraded land areas; Adaptation to climate changes; Risk assessment and management of natural disasters; Land use planning; Infrastructural networks (e.g. water, transportation, roads, agricultural & industrial facilities); Waste management; Urban development planning (Attorre et al 2016; website PROGES).
ISP40 technologies and application methods are aimed at the quantitative, systemic and objective analysis of key social, economic and environmental dynamics involved in the ecosystems' management.
All the elements that the software is showing are coming from a step-by-step procedure in which the EBM Working Groups are asked to participate to build the best representation of the target area. The

step-by step process mentioned before is mainly consisting in two phases which are called *Ecosystem Context Analysis* and *System Cause-Effect Analysis.*
During the first stage of the *Ecosystem Context Analysis*, the multi-disciplinary teams are invited to imagine the target area as distinct levels (Figure 2.2).

Figure 2.2
Simplified example of layers that, in their whole complexity, describe the real world (From Asma and Afhra 2011, modified).



The identification of the main of the ecosystems, services and socio-economic characteristics of the area helps the EBM Working Groups to decompose the reality in several sectors, and consequently add the descriptions in a set of matrices (tables), in which all the aspects – that are called components - of the sectors are listed and described one by one in each row of the matrix. To move from conceptual (system matrixes) to qualitative-structural (system diagram) representation, during the second stage of this phase the EBM Working Groups are introduced to the ISP. The software allows to draw a diagram, the qualitative representation of the target area, in which every component is linked with a box, and the relations between components are shown as arrows.

The *System Cause-Effect Analysis*, carried out with a series of workshops, represents the second stage of what is defined step-by-step process and it consist in a table where the each component will be quantitively described, followed by another one directly linked with the relation (arrow) to the first; the last column of the table is to identify management initiatives linked with the sustainable use of the ecosystem services. It can be performed only after the data are collected, analysed and entered in the ISP. Once that the software is able to return a quantitative representation of the target area, the EBM Working Group would be able assessing the conservation status of and the threats to each component of the ecosystem and estimating the current level of use, or overexploitation, or untapped-potential of the ecosystem services. Moreover, like mentioned above, they will use the assessments and estimations to draft management initiatives and future actions.

ISP40 doesn't provide automatic recommendations, it is supporting decision tool, meaning that it is helping the users to understand the ecosystems and their dynamics, interpret the data, working alone or in a group to make choices. This involves supporting the evaluation and the comparison of alternatives through quantitative methods.

2.2 - Development process: key activities

Activities for the development of the Mediterranean Forum For Applied Ecosystem-Based Management have been executed according to the methodological approach described above and organised in six Work Packages (WPs) (for details of all the WPs, see MED4EBM Report 3.1.1, August 2020). WP3 and WP4 focused on establishing the EB-ICZM cooperation and coordination platform in each of the project's target areas using the PROGES-ISP package. More specifically, WP3 was dedicated at establishing one Ecosystem-based ICZM Decision Support Systems (EBICZM-DSS) in each of the project's target areas (See Paragraph 2.1).
The protocol, developed thanks to the participation and contributions of the EBM Working Groups and stakeholders, is associated with the use of 1) the PROGES-ISP software for the analysis of spatial and tabular datasets and 2) the DMT, a new tool to store the original DBs, the procedure how to collate data and elaborate them, and other key information, such as the name of the data providers.

The deployment of WP3 and WP4 was organized in six operational phases, listed below:
Phase 1. Inception activities: Partner's base training, thematic scoping, and stakeholder analysis.
Phase 2. Ecosystem Context Analysis: recognizing connections within and across ecological and human systems spanning over the focused area.
Phase 3. Development of indexes and indicators for the quantitative assessment of EB-ICZM social, economic, and ecological dynamics.
Phase 4. Data gathering and construction of tabular and GIS databases.
Phase 5. System Cause-Effect-Analysis: assessment of ecological risks and socio-economic stresses and identification of management interventions.
Phase 6. Mainstreaming EB-ICZM measures into local development plans.

2.3 – Users

For the deployment of WP3 and WP4 in the four target areas (Gulf of Corigliano, Italy; Gulf of Aqaba, Jordan; Kneiss Islands, Tunisia; Tyre Coast Nature Reserve, Lebanon), the EB-ICZM Technical Team the MED4EBM EB-ICZM Technical Team worked in close coordination and collaboration with EB-ICZM Local Units established by AdT, INSTM, JREDS and TCNR in the four MED4EBM.
Except PROGES which is the Project Partner 1 (PP1), and the developer of the ISP application, the other partners were trained to the application of the EB-ICZM methodology and the software.

Table 2.1 – *MED4EBM Partners,* potential users and actual and potential uses of the Ecosystem-based ICZM Decision Support Systems (EB-ICZM-DSS)

Institution	**Uses**
ITALY	
Project Partner 2 (PP2) - *Amici della Terra* Onlus	- Liaise and get data from the pertinent institutions to feed the database and maintain the ISP - Framework for collaborations - Integrated management measures - Promote the availability of data with the adequate spatial or temporal resolution, and suitable format
Local administrations:	- Integrated management measures

• Amendolara • Albidona • Trebisacce • Villapiana • Cassano allo Ionio • Terranova da Sibari • Tarsia • San Demetrio Corone • Santa Sofia D'epiro • Corigliano – Rossano	- Investing in creating DB with the adequate spatial and/or temporal resolution and suitable format - Handing DBs in shared data banks - Expressed interest in political and technical support to the implementation of the management measures identified during MED4EBM project
JORDAN	
Project Partner 3 (PP3) - Royal Marine Conservation Society of Jordan (JREDS)	- Liaise and get data from the pertinent institutions to feed the database and maintain the ISP - Framework for collaborations - Integrated management measures - Promote the availability of data with the adequate spatial or temporal resolution, and suitable format
ASEZA (Aqaba Special Economic Zone Authority)	
TUNISIA	
Project Partner 4 (PP4) - Institut National des Sciences et Technologies de la Mer (INSTM)	- Liaise and get data from the pertinent institutions to feed the database and maintain the ISP - Framework for collaborations - Integrated management measures - Promote the availability of data with the adequate spatial or temporal resolution, and suitable format
DGPA (*Direction Générale de la* Pêche *et de l'Aquaculture*. Translation: General Directorate of Fishing and Aquaculture)	
DGF (*Direction Générale des Forêts*. Translation: General Directorate Forestry)	
APAL (*Agence de Protection et Aménagement du Littoral*. Translation: Agency of Protection and Development of the Coasts)	
LEBANON	

Project Partner 5 (PP5) - Tyre Coast Nature Reserve (TCNR)	- Liaise and get data from the pertinent institutions to feed the database and maintain the ISP - Framework for collaborations - Integrated management measures - Promote the availability of data with the adequate spatial or temporal resolution, and suitable format

2.4 - Key features

2.4.1 – ISP

The PROGES-ISP is a user-friendly Microsoft Windows application that can support the several planning and management pursuits, from strategic to routine monitoring and management tasks (PROGES website). The implementation of PROGES-ISP applications was supported by working together with partners and stakeholders in two main workshops' sessions, called Ecosystem Context Analysis and System Cause-Effect Analysis (Figure 2.1 and 2.2).

Figure 2.1
Developing the ISP: every step of the process was carried out with stakeholders and partners (figure M. Onori)

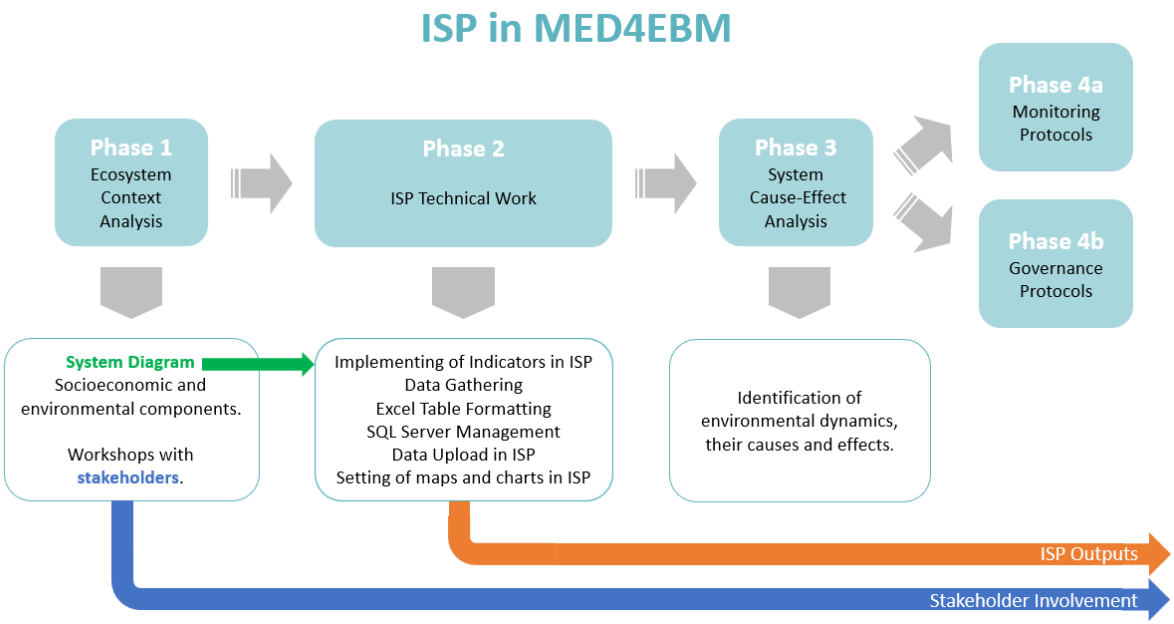
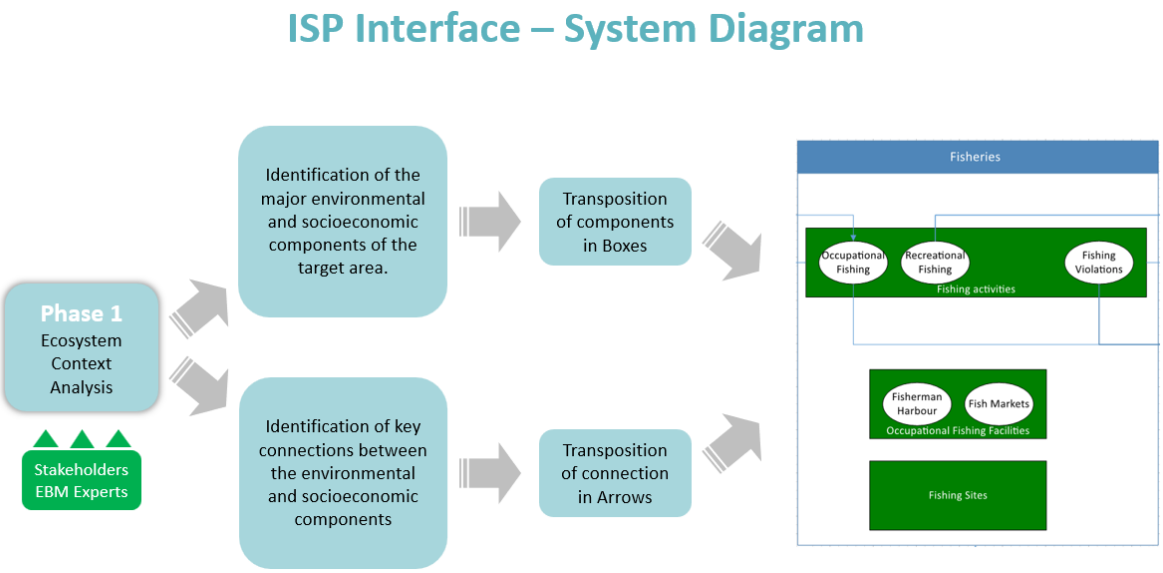


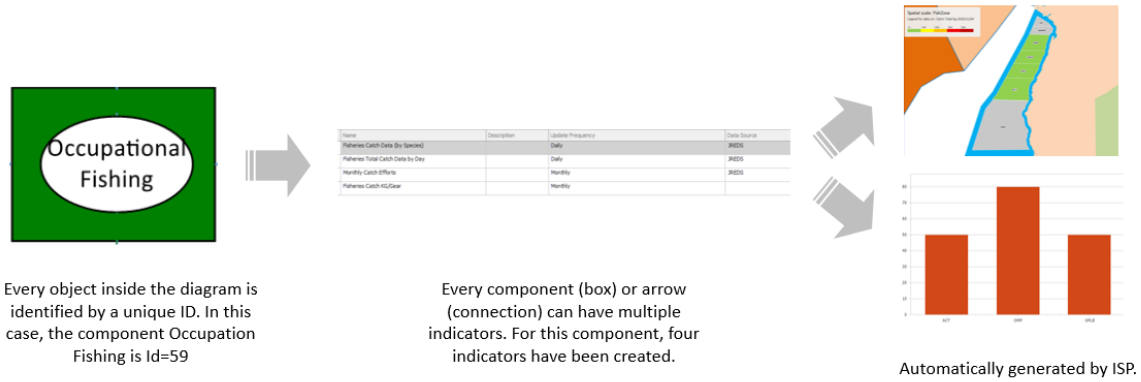
Figure 2.2

Ecosystem Context Analysis: from a conceptual and qualitative description of the target area to a schematic and quantitative representation of its aspects (components) and relations (arrows) in the ISP (figure M. Onori)



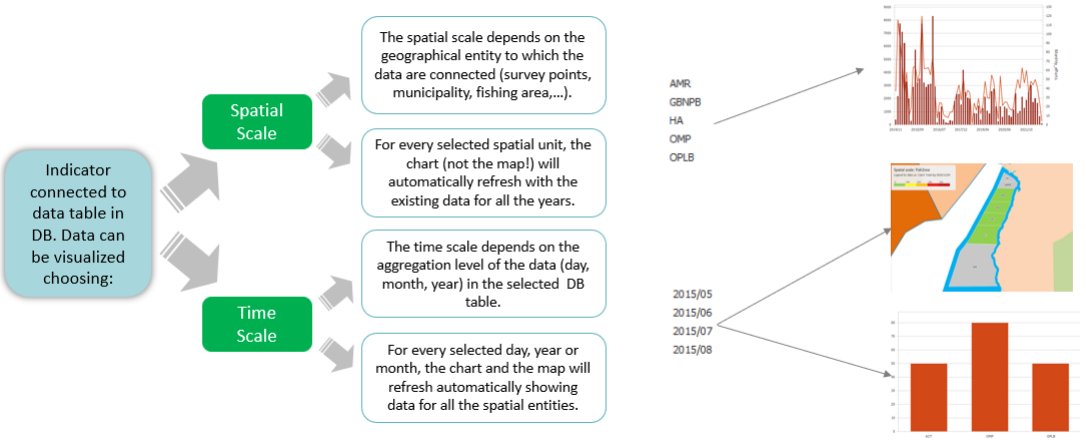
Once that the diagram in the ISP is completed, for each box – component – EBM Working Groups are requested to provide a set of indicators to quantitatively characterize each component and sub-component of the system-diagram (for more details, see Attorre *et al* 2016). It is possible to select any of the boxes (components) or arrows (connections) to add the data previously uploaded as a table into a connected DB (Figure 2.3).

Figure 2.3
The creation of indicators, which is connected to one table inside the DB (figure M. Onori)



Once the indicator has been created and linked to the related box or arrow in the system diagram, ISP asks the user to connect the indicator to the required table previously uploaded in the DB. In this way, the indicator will be fed with data in the selected DB table (Figure 2.4).

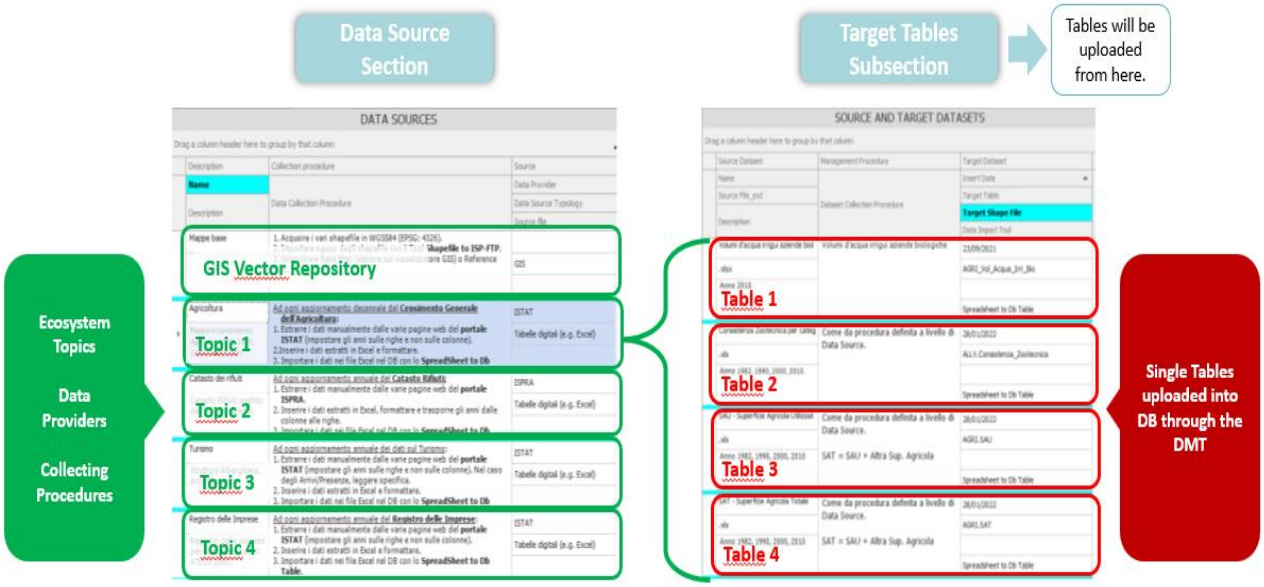
Figure 2.4
ISP Interface: the data can be visualized on spatial and time scales through charts and maps (figure M. Onori)



2.4.2 – DMT

The Data Management Toolbox (DMT) is a repository of data (GIS vectors, tables, documents and reports) accessible from the ISP software.
It is composed by four sectors: Dataset typologies (such as tables, shapefiles, SQL DB), Data Providers acronyms and names of data providers), Source Datasets (Figure 2.5), DMT to Tabular Db Mapping.

Figure 2.5
DMT view (figure M. Onori)

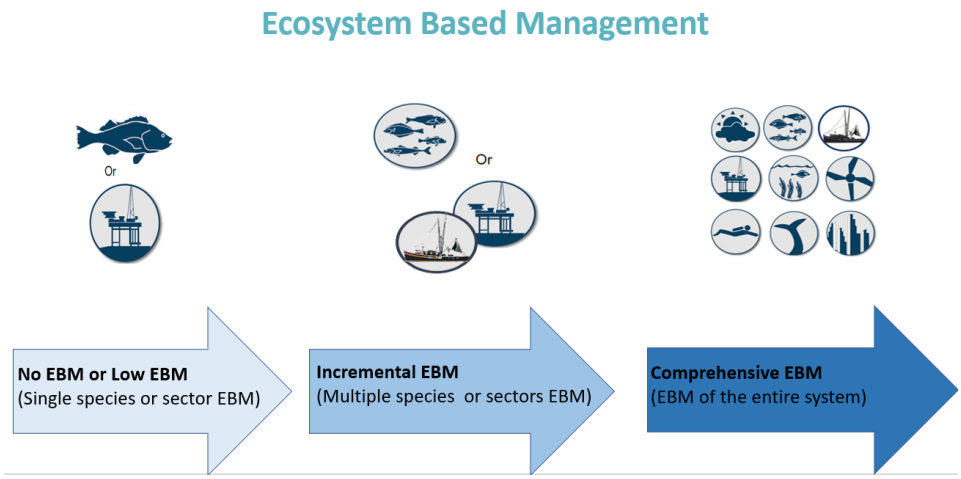


The page “DMT to Tabular Db Mapping” allows to retrieve the tabular data associated to the indicators in the system diagram and the original DBs handed by the data providers, so the traceability and transparency of the original sources’ information are guaranteed.

2.5 – Stakeholders analysis and decision-making process

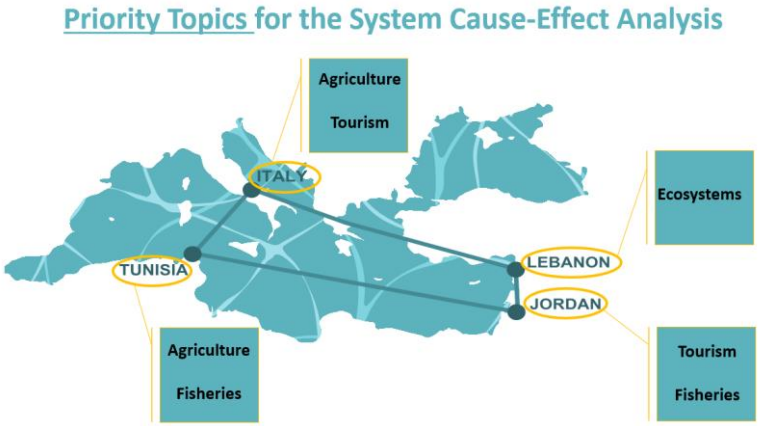
MED4EBM aimed to a comprehensive EBM approach. During the development of it, after the data collection phase, the project decided to select, for each country, few priority topics. This meant that MED4EBM shifted their focus and applied an incremental EBM (Figure 2.6)

Figure 2.6
The shift from comprehensive to incremental was a coherent choice of MED4EBM



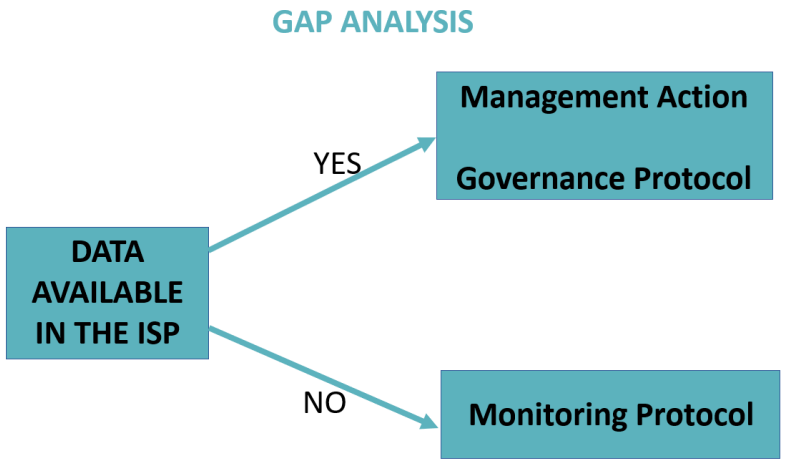
The priority topics were chosen by the teams of each country based on different criteria, including the presence of data inside the IPS, components provided of time series data vs occasional data, and others. The topics shown in figure 2.7 were further analysed with the System Cause-Effect Analysis.

Figure 2.7
Priorities topics analysed during the System Cause-Effect Analysis



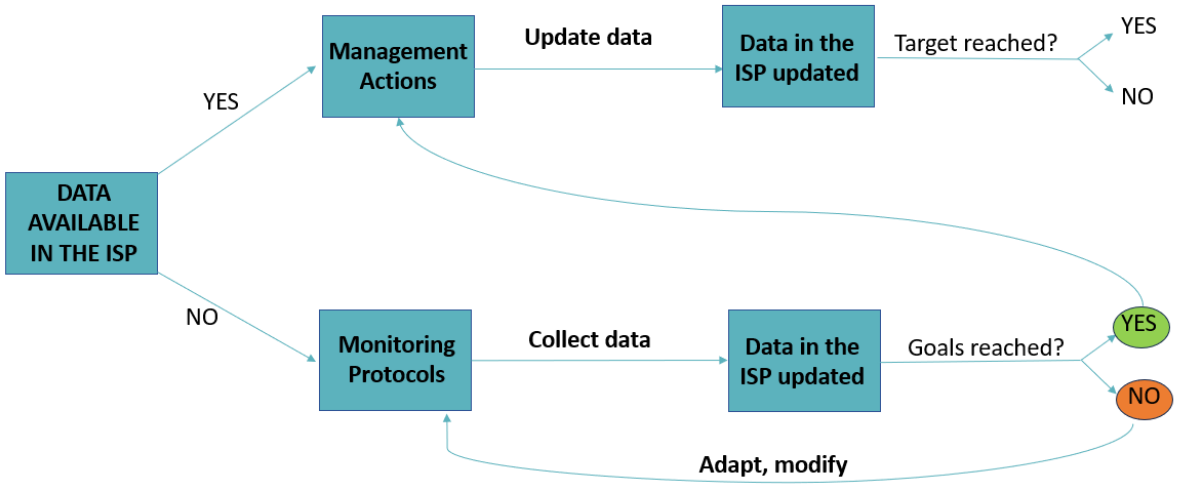
After that above mentioned analysis, the teams were asked to suggest and formalise some initiatives. If the gap analysis, carried out during the System Cause-Effect Analysis, demonstrated that in the ISP there still was a lack of information, the solution suggested was to recover the data. Otherwise, there were reasonable elements to suggest some management action (Figure 2.8).

Figure 2.8
Gap analysis during the System Cause-Effect Analysis



The choice of the teams of carrying out a monitoring protocol to recover the lacking information is only a necessary step, not only to update the ISP, but also to design, plan and implement a specific and targeted action in the future (Figure 2.9).

Figure 2.9
Schematic representation of the adaptive management in MED4EBM



2.6 - Added values

- Helping decision makers and stakeholders to reach a better understanding of how environmental, social and economic considerations fit together, as well as to adequately communicate such understanding to the public.
- Providing a manageable framework to enable decision makers think through the consequences of their actions.
- Contributing to a more transparent planning, involving key stakeholders in the decision-making process, integrating their concerns and priorities into land management policies, plans and programs.
- Highlight mistakes in the DBs and communicating in constructive way with data providers.
- Building opportunities for DBs' improvements.
- Building trusting and collaborative relations with the data providers.
- Synergies to optimise resources, joining initiatives.
- Capacity building.
- Data gap analysis and recover missing data with specific monitoring action.

2.7 – Data collation and collection from data providers, repositories and from references

The data collection was carried out in three main ways: a) From data providers; b) Online repositories; c) References (scientific articles, technical reports and so on).

a) Data from data providers. This responsibility was given to the MED4EBM partners, that followed different procedure to obtain the data, depending on the country.
b) Online repositories were explored by the MED4EBM partners as well as the technical team. In particular, this opportunity was investigated for flora and fauna data, in order to contribute to enlarge the quantity of information, in the hypothesis that the data gathered were not complete or scarce, in particular for some taxa.
c) References: the references search was carried out constantly but intensified mainly in the summer 2021. The outcome were four folders, one for each country. All the works were separated in "Old repository" (references and raw data collected previously), "Final Repository" (references analysed and recommended) and "Discarded Repository" (references were excluded from the analysis). The articles and reports in the second list were read and the significant or relevant information were extracted in a document with the correlated recommendations where and how to extract information from them.

2.8 - Gap analysis and data collection

The data collection phase was identified, by more than one subject in MED4EBm, as the main challenging phase. It really depended on the approach of each single partner, and their stakeholders. Tunisia selected only the time series data, and – with it – it based the selection of the priority topics and the following steps only on that criteria. Lebanon continued to develop the ISP and its contents only based on the online repositories. Jordan selected the time series data and then write the protocols to recover the complementary information, still lacking in the ISP. Italy collected online data, but then developed a strategy to guarantee the flow of data based on awareness and active collaborations from the data providers.

2.9 – Challenges and lessons learnt

The Project aims at enhancing capacities of institutional stakeholders involved in the management of coastal and marine areas, and at establishing a collaborative and coordinated platform to effectively implement Ecosystem-Based Integrated Coastal Zone Management (EB-ICZM). EBM-DSS applications deals with complex situations that can be facilitated through functional regional nodes, that share similar cultural and political conditions. Mediterranean and Red seas are biodiversity hotspots, undergoing intensive demographic, social, cultural, economic and environmental changes.

The challenge of ensuring a heterogeneous and well represented group of stakeholders definitely dealt with the Covid pandemic. The MED4EBM teams were bound to start and continue the EBM-DSS process mainly online, dealing with logistic issues and the challenge to coordinate the workshops from distance. In few cases, the lack of informatic support and a strong internet connection risked jeopardising the outcomes. The constructive and constant communication with the partners on one side, and between them and the stakeholders on the other gave the project the opportunity to find very flexible solutions, tailored based on the different requests from the partners, their team and stakeholders. One of the targets of MED4EBM was to capitalise the EB-ICZM results creating the Mediterranean Centre for disseminating EBM tools and methods, a platform that promote synergy and linkages between projects and the competent management bodies in the field of coastal and marine ecosystem resources. Moreover, the project took part to the 2020 Forum of Marine Protected Areas in the Mediterranean. This forum aimed to contribute to the finalisation of the Post-2020 Roadmap for Mediterranean Marine Protected Areas, and MED4EBM was keen to give its contribution and, at the same time, inform the participants of the opportunity of the dissemination of EB-ICZM principles and applications. By working together, they can share successful experiences and confront common challenges, thus replicating and upscaling proper management regimes within and beyond national boundaries.

References:

Asma Th. Ibraheem and Afrah M. Daham 2011. Development and Use of Large-Scale Land Information System (LIS) by Using Geographic Information System (GIS) and Field Surveying. Iraqi Journal of Civil Engineering 8(1): 29-43.

Attorre F., Falcetta M., Pella F., Prada M., Scepi E., Torres R.E. and Vanzella-Khouri A. 2016. Building a user- friendly Decision Support System while improving community participation: a case of Ecosystem-Based Management in Dominican Republic. 69th Conference of Gulf and Caribbean Fisheries Institute (GCFI) – Grand Cayman, Cayman Islands. 7-11 November 2016.

Lysenko N., Pella F., Scepi E., Scaramuzzo F. A., Acevedo Y. 2019. Decision Support System, based on a set of information, data and indicators, for integrated management of the coastal-marine environment. Final outcomes of the Caribbean EBM-DSS pilot project of Dominican Republic. 72nd Conference of Gulf and Caribbean Fisheries Institute (GCFI) – Punta Cana, Dominican Republic. 4-8 November 2019.

MED4EBM Report 3.1.9, December 2020. https://www.enicbcmed.eu/sites/default/files/2021-02/3.1.2_Work%20Packages%203%20and%204.%20Technical%20Report%20on%20activities%20executed%20and%20deliverables%20produced.%20Phase%201.%202020-12-14.pdf

MED4EBM Report 3.1.1, August 2020. https://www.enicbcmed.eu/sites/default/files/2021-02/3.1.1_Technical%20and%20methodological%20references%20and%20operational%20framework%20for%20the%20execution%20of%20WP3%20and%20WP4.%202020-08-04.pdf

PROGES Consulting website. http://www.progesconsulting.it/

Pella F., Lysenko N., Mateo P., Scepi E. and Falcetta M. 2021. The challenge to be sustainable, systemic and synergic: lessons learnt from the Caribbean EBM-DSS. (Long abstract for) 74th Annual Conference of the Gulf and Caribbean Fisheries Institute Virtual Meeting. 8-12 November 2021.