

## **MED4EBM**

**Mediterranean Forum For Applied Ecosystem-Based Management**

# **CONSULTANCY FINAL REPORT**

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Consultancy Final Report

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## List of acronyms and abbreviations

ADT	Amici della Terra
DB	Database
CRS	Coordinate Reference System
DMT	Data Management Toolbox
DSS	Decision Support System
EBM	Ecosystem-Based Management
ENI CBC Med	Mediterranean Sea Basin Programme
GIS	Geographic Information System
ICZM	Integrated Coastal Zone Management
INSTM	National Institute of Marine Sciences and Technologies
JREDS	Royal Marine Conservation Society of Jordan
MED4EBM	Mediterranean Forum For Applied Ecosystem-Based Management
PP	Project Partner
PROGES-ISP	PROGES Integrated Spatial Planning
QGIS	Quantum GIS
TCNR	Tyre Coast Nature Reserve
WP	Work Package

## Abstract

The "Consultancy Final Report" stands as the fourth and last deliverable of the Environmental Monitoring and Data Management Expert consultancy. It serves as a comprehensive synthesis of the entire consultancy's work, combining the initial assessments with the technical interventions performed in order to improve the level of consistency of the four Project Partners systems. In particular, it includes a meticulous evaluation of the systems diagrams, indicator implementation, GIS vectors, and data repositories, which were addressed thanks to the direct access provided by all the Project Partners to their respective database and to PROGES-ISP software.

Additionally, this report provides a strategic transition to the phases that will come after the end of the Project. In fact, a list of recommendations is provided to manage existing data, new data coming from protocols, and new vector GIS data in a way that maintains system flexibility and harmony with stakeholder inputs. without burdening the system. These recommendations are essential to prevent the system from becoming burdened and to ensure that, in the future, ecosystem analysis remains efficient, rapid, and, most importantly, precise in all the target areas.

## 1. Context

MED4EBM is a partnership project funded by the ENI CBC MED 2014-2020 Programme. The core technical activities and outcomes of the MED4EBM project are incorporated into WP3 and WP4. The primary objective of these work packages is to establish integrated schemes of Ecosystem-Based Management of coastal and marine areas in designated areas of four Mediterranean countries:

- PP2: ADT, Gulf of Corigliano, Natural Reserves of Lake Tarsia and the Mouth of the Crati river (Italy)
- PP3: JREDS, Gulf of Aqaba, Aqaba Marine Reserve (Jordan)
- PP4: INSTM, Kniess Islands Nature Reserve (Tunisia)
- PP5: TCNR, Tyre Coast Nature Reserve (Lebanon)

EB-ICZM is an environmental management approach aimed at contributing to the conservation and sustainable development of coastal areas. It emphasizes the role of ecosystem services and strives to harmonize economic and social interests with the protection and enhancement of the natural environment. Coastal areas, known for their environmental fragility and ecological diversity, as well as their high level of human activity, require integrated spatial development strategies that balance active conservation and territorial enhancement, involving local communities. For these reasons, the deployment of WP3 and WP4 was organized in into successive phases, developed through a participatory approach in collaboration with local administrations and stakeholders. These phases can be summarized as follows:

- **Ecosystem Context Analysis:** This phase involved a participatory analysis of the project area, considering all relevant ecosystem components as identified by stakeholders and local institutions. Their active participation helped develop a structured, manageable, and understandable model representing the components and services of the ecosystem, associated human activities, and relevant ecological interactions. All biotic, abiotic, and economic components identified during the participatory process, as well as the key connections between them, were then spatially organized using symbols and lines in a system diagram. Moreover, indexes and indicators for the quantitative assessment of EB-ICZM social, economic, and ecological dynamics were in this phase identified.
- **PROGES-ISP Software Implementation:** The application of EBM strategies requires in-depth knowledge of the studied territory and its ecosystem dynamics. To cover the wide range of thematic areas identified during the Ecosystem Context Analysis and incorporated into the system diagram, large datasets are required to assess the indices and indicators defined by stakeholders in the project's initial phase. During this stage, data collection activities were conducted in order to systematize existing knowledge into a Decision Support System (DSS) developed by PROGES, the technical and methodological partner of MED4EBM. This type of tool is designed to automatically process large amounts of data and can integrate tabular and geographic information, enhancing decision-making processes that are not entirely structured. The software used in MED4EBM is called ISP and it automates the presentation of thematic data in the form of graphs and maps, helping experts and stakeholders in performing diachronic or synchronic analyses based on their needs while maintaining an overall view of other territorial themes. This report specifically focuses on the actions undertaken for the implementation of this phase in the framework of the consultancy. Technical expertise and assistance will be delivered to the Project Partners in environmental and socioeconomic monitoring and data management within PROGES-ISP. This support aims to enhance project implementation and strengthen decision-making processes in the four Project's Target Areas.



- **System Cause-Effect Analysis:** This constitutes a key step in the application of EB-ICZM strategies because it has the dual objective of estimating the current and potential use of ecosystem services and identifying ecological risks and socio-economic stresses in each Project area. A series of workshops involving local experts and stakeholders led to the identification of the pressures exerted on the ecosystem by various drivers, which were then evaluated and quantified through the implementation of a set of environmental indicators in PROGES-ISP.
- **EBM Integrated Management Protocols:** in this project phase a systemic, indicator-based, and participatory analysis is performed to develop EB-ICZM Governance Protocols in each of the MED4EBM target areas.

## 2. Methodology

The proposed methodology aimed to provide technical expertise and assistance to the Project Partners in environmental and socioeconomic monitoring and data management. All the phases of the methodology were performed on and with the use of the DSS PROGES-ISP, the software used for facilitating the decision-making process. The level of implementation of the four different systems were initially assessed. Subsequently, technical adjustments at various levels were made to refine and enhance the systems in terms of data management and visualisation. This work, instead of being an individual effort on the different systems, was conducted in parallel with local teams, who participated in simultaneous mentoring following the principle of training by doing on the continued use of the software.

### 2.1 System Technical Assessment

In the first part, the activities that were needed to assess the implementation progress of the four Project Partners were covered. The process of identifying critical actions for enhancing the four systems, in terms of data quality, quantity and visualisation, was executed using a standardized methodology. This methodology was consistently applied to each Project Partner's context, and its details are provided here:

- **System Diagram:** The initial step involved a comprehensive review of the system diagram at the Project's four target areas. In essence, the system diagram serves as a visual cornerstone of the PROGES-ISP system, and adhering to these guidelines ensures its effectiveness in conveying complex ecosystem information in a clear and user-friendly manner. The assessment of the system diagram took into account the following three criteria:
  - **Clarity and readability:** The system diagram should be aesthetically pleasing and easy to read. Component and sub-component names should be clearly legible, and a coherent colour scheme should be employed to prevent confusion. Spatial organization should be intuitive and straightforward.
  - **Simplicity and Efficiency:** The system diagram should be flexible, not overloaded by unnecessary components, and free from repetition. It should encompass all environmental and socio-economic elements relevant to describing the project area in a concise manner.
  - **Data Accessibility:** The diagram should facilitate easy data retrieval. Users should be able to quickly identify components or sub-components and guess the type of data associated with each. This is crucial for swiftly and effectively interpreting ecosystem dynamics in the EBM approach.
- **Indicators, Charts, and Maps:** The assessment addressed the efficacy of indicators, charts, and maps employed within the systems. This examination focused on the accuracy, relevance, and comprehensibility of the data presentation. At the end of this phase, data and indicators within the existing databases and PROGES-ISP systems that require enhanced representation were identified.
- **GIS Base and Reference Maps:** The assessment evaluated the GIS default map, which is visible whenever each Project Partner's system is opened within PROGES-ISP. Moreover, in cases where GIS vectors play a pivotal role for data visualisation, the assessment addressed also the GIS base and

reference maps. This assessment was needed in order to enhance the digitalisation quality and utility of spatial data. Moreover, new GIS vectors that should have been added to the PROGES-ISP software were identified.

- **Data Management Toolbox:** The assessment process also involved the repository of data and metadata implemented in the software. The objective was to optimize data handling processes and workflows to expedite the management of data. This assessment was addressed using the "DMT to Tabular DB Mapping" tool in order to validate the alignment between the implemented indicators in PROGES-ISP's DMT and the tables and views in the DB.

The assessment of system implementation, based on the four outlined points, was carried out with different levels of detail. The depth of evaluation was customized for each Partner's system, contingent upon their specific technical advancements. The distinctions in the level of detail are clarified as follows:

- **PP2: AdT, Italy:** A comprehensive and concise evaluation was conducted, taking into account the advanced stage achieved in system implementation, encompassing both the database and software levels.
- **PP3: JREDS, Jordan:** An in-depth evaluation was undertaken based on the initial assessment of the system's condition. Although a substantial amount of data has been implemented and loaded, significant challenges have arisen in the logical workflow of the whole system, spanning issues at both the DB and software levels, as well as within the GIS and Data Management toolbox level.
- **PP4: INSTM, Tunisia:** A comprehensive and concise evaluation was conducted, taking into account the advanced stage achieved in system implementation, encompassing both the database and software levels.
- **PP5: TCNR, Lebanon:** Considering the significant incompleteness and deficiencies across all system levels, the primary emphasis of the evaluation was on providing recommendations for establishing a proper and sustainable approach to fill the system.

## 2.2 System Technical Refinement and Enhancement

Following the process of pinpointing crucial measures to improve the four systems, they have been refined and enhanced with technical actions in terms of data management in the DB and visualisation through maps and charts within PROGES-ISP. The focus was mainly on the enhancements for the Jordanian and Lebanese systems that, after the initial assessment, have shown to be more deficient in terms of data quality, representation, and organization within the DB and PROGES-ISP. The technical interventions are in this report listed, and the steps to achieve the desired enhancement condensed into summaries. Each technical refinement had repercussions across multiple interconnected levels in a chain, as it necessitated improvements and modifications at all of the following enumerated levels:

- **Excel Level:**
  - Scrapping of data from online repositories and reports.
  - Preparation of tables in new sheets.
  - Formatting of new and old tables.

- Database Level:
  - Creation of new tables.
  - Alter, Update, Drop of old tables.
  - Creation of new views.
  - Correction of old views.
  
- PROGES-ISP Level
  - New indicators creation.
  - Spatial, time, data series setting up.
  - Old indicators correction.
  - Modification or enhancement of charts and maps.
  - Setting up of new GIS vectors for base and reference maps.
  - Setting up of Data Management Toolbox.
  
- GIS Level:
  - New GIS vectors creation.
  - Old GIS vectors correction in digitalisation.
  - Digitalisation of maps on reports.
  - Update and clarification of GIS vectors acronyms.
  - Enhancing GIS default maps of PROGES-ISP.

### 2.3 Technical Mentoring “Training by Doing” and Events

The consultancy included providing guidance on data analysis and result interpretation. The technical mentoring was conducted in the form of "Training by Doing," and it must be considered an integral part of the improvement, refinement, and enhancement phase of the system. Indeed, during these training sessions, active work was carried out on the tables and views of Project Partner’s databases, as well as on indicators, charts, and maps within PROGES-ISP. Additionally, efforts were directed towards organizing metadata and data collecting and updating procedures within the Data Management Toolbox. This hands-on approach in training contributed significantly to the practical enhancement and optimization of the system. For this purpose, a comprehensive step-by-step technical manual was first prepared and shared with local teams to aid in these training sessions. Afterwards, the technical assistance and guidance were offered to Project Partners though:

- Online technical training sessions, in collaboration with other experts in EBM. These training sessions were tailored to meet the specific requests of Project Partners and focused on using DBs and the DSS PROGES-ISP.
  
- Two in-person workshops that took place in Lebanon and in Jordan. These workshops provided hands-on training on DB management and the implementation of the PROGES-ISP system. Special attention was given to understanding system diagrams, working with indicators, and setting up the Data Management Toolbox. Detailed agendas for these workshops can be found at the end of the document.

Among the various training components, there was a specific focus on GIS, covering vector and raster typology data, as well as an overview on the CRS. This training serves as a foundational aspect of the overall effort to enhance data management practices since a GIS visualiser is implemented in PROGES-ISP.

## 3. System Technical Assessment

### 3.1 PP2: AdT, Italy

#### 3.1.1 System Diagram

The Italian system diagram consists of two main parts. The environmental matrix contains components and sub-components related to flora, fauna, habitats, and hydrography. In the socio-economic matrix, components related to human activities are included, which are generally the ones exerting pressure on the environmental matrix. It should be noted that the Italian system diagram has already undergone a significant review and restyling process. On one hand, this process improved the overall graphical appeal. On the other hand, it aligned the names of components and sub-components with the official names provided by the authorities and institutions responsible for data production and publication (e.g., agriculture, following the names provided by ISTAT for the General Agricultural Census). The evaluation can then be conducted according to the three criteria identified in the methodology chapter.

##### 3.1.1.1 *Clarity and readability*

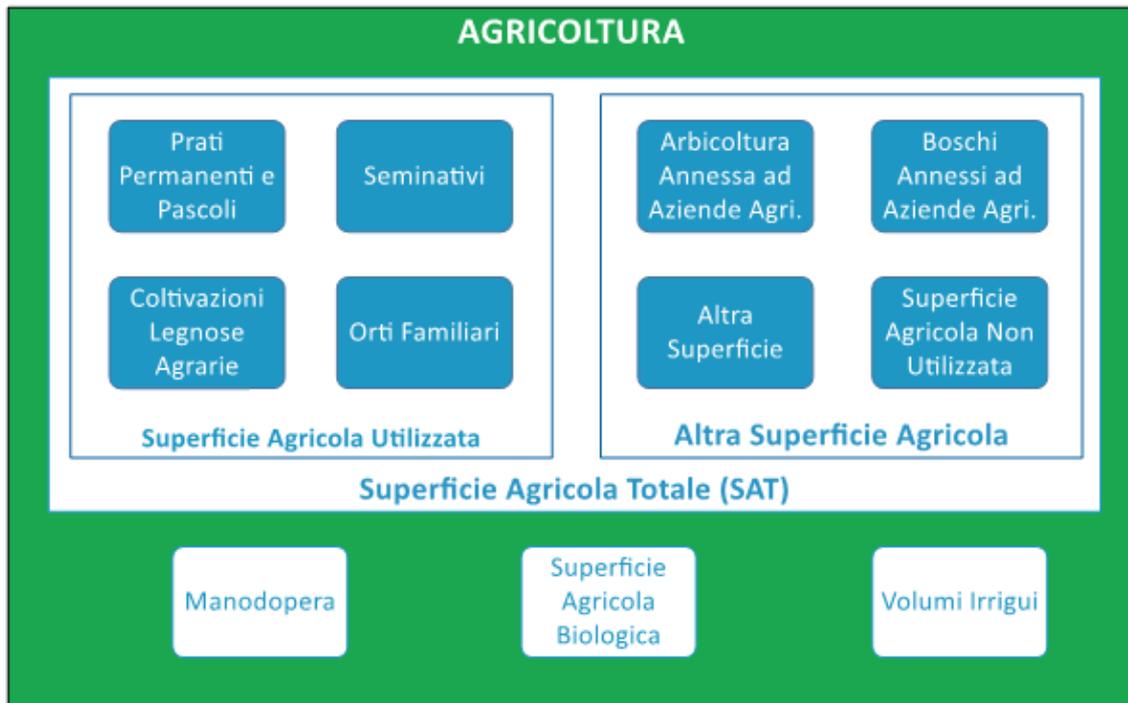
- The system is well-structured into two matrices, with a spatial organization of components and arrows that is very visually appealing and clean.
- The choice of colours to represent components, sub-components, and arrows at various levels is highly effective. The texts (e.g., component names) are in this way easily readable.
- The selected shapes for the components and sub-components are appropriate and standardized, both in terms of height and width.
- The text size is adequate and well-balanced according to the significance of the identified items. Capital letters are used for the components, while lowercase letters are used for subcomponents.
- The diagram is easily readable on a single screen, without the need to zoom in or navigate in multiple directions. This makes the diagram suitable for easy and immediate printing without any adjustments.
- The system has been designed to be read and interacted with by stakeholders and local institutions, which is why it is in Italian. However, the only observation that can be made is the lack of an English version that could be used internationally for disseminating results.

##### 3.1.1.2 *Simplicity and Efficiency*

The system diagram is free of repetitions, and the components are sufficient in number without redundancy. The idea of subdividing the components of agriculture and tourism, the two most important components in the project area that exert significant pressure on the environmental matrix, across multiple levels is quite intriguing. This pyramid-like organization allows access to the data at various levels of detail based on the analysis and understanding needs of ecosystem dynamics.

### 3.1.1.3 Data Accessibility

With this system diagram structure, even a non-expert user can easily access the required information by readily identifying the component of interest. This ease of use is facilitated by the thorough review process that the diagram has undergone, aligning the component names with the nomenclature of the data provided by the official entities responsible for data collection and sharing. Additionally, data accessibility is made easier by the simplicity and cleanliness of the system diagram and its components, logically organized into two distinct matrices.



*Example of multi-level component.*

### 3.1.2 Indicator, Charts, and Maps

During the MED4EBM project, the local Italian team focused on system implementation and data loading into the database and then into PROGES-ISP. As of today, the Italian system is more than adequately implemented in terms of data. Data collection was conducted on a parallel track. On one side, data was gathered from stakeholders who participated in the workshop cycle for defining the system diagram, often through bilateral agreements. Alternatively, an intense work was carried out in online databases to gather data on various remaining uncovered environmental and socio-economic themes. Remarkably, significant efforts were made to clean and load genuinely valuable data, without burdening the system with an unnecessary volume of data that may not be essential for implementing EBM in the target area. For an overall assessment of the Italian system in terms of indicators, charts, and maps, it is important to highlight some key points:

- **Quantity of Implementation:** There is a significant imbalance in the loaded data between the environmental matrix, which is relatively poor in terms of implementation, and the socio-economic matrix. The latter is rich in all its components, with indicators collecting data from both tables and views loaded into the database. Numerous official environmental indicators are included for environmental assessment and human practices. Therefore, it is advisable to work even more

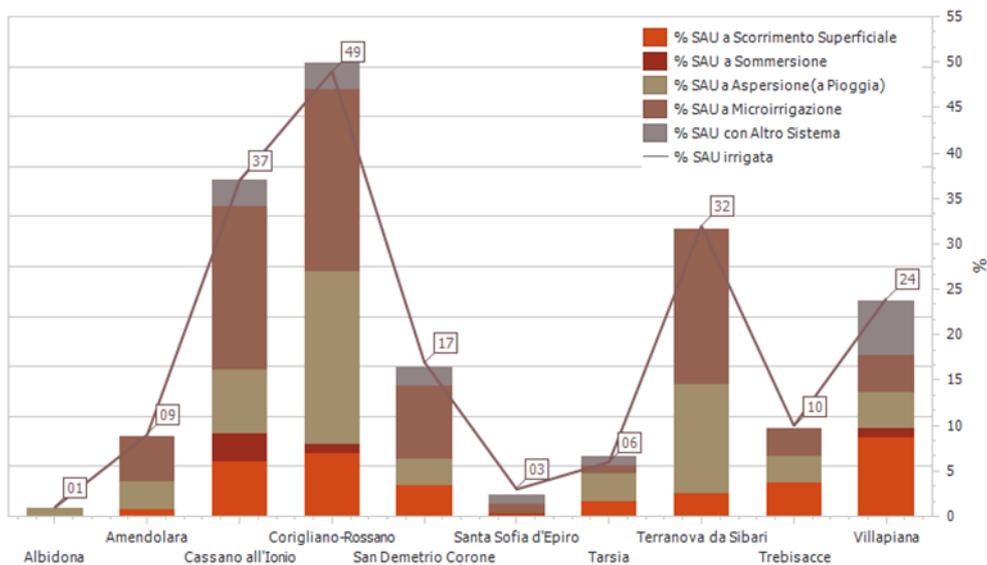
intensively to address the gaps in the environmental matrix, attempting to engage stakeholders for data provision if they are not available in online data banks.

- **Quality of implementation:** All the loaded indicators are well-configured in terms of spatial scale and time scale. Descriptions, update frequency, and data sources are provided in great detail. Unfortunately, all this information is in Italian. It would be advisable to add translations into English for each indicator and the related fields used for describing it.

Name	Description	Update F...	Data Source	Notes
% SAT su Superficie Comunale	Indicatore	10 Anni	ISTAT - Censimento Generale dell'Agricoltura	NB: Considerare solo il 2010 in quanto è stata utilizzata la superficie comunale al 2010. Negli anni precedenti ci sono state delle variazioni dei confini (ad esempio un ridimensionamento di Trebisacce per cui vengono percentuali di SAT superiori al 100% della superficie totale nel 1982).

*Example of indicator description.*

- **Quality of chart visualisation:** In terms of chart representations, all the indicators in the system offer clear visualizations. The legends, albeit in Italian, are clear and comprehensive. The charts have axis names, and bar labels are also present when needed. Many views have been created to aggregate data at various spatial and temporal scales, allowing for a more comprehensive and clear analysis through charts that can shed light on environmental phenomena from different perspectives.



*Example of data visualisation with chart.*

- **Quality of map visualisation:** Where available, map visualization is well-configured, with appropriate class divisions and standardized colour palettes that are consistent across themes (e.g., the same shades of yellow are used for all agriculture-related components and subcomponents).



*Example of data visualisation with map.*

### 3.1.3 GIS Base and Reference Maps

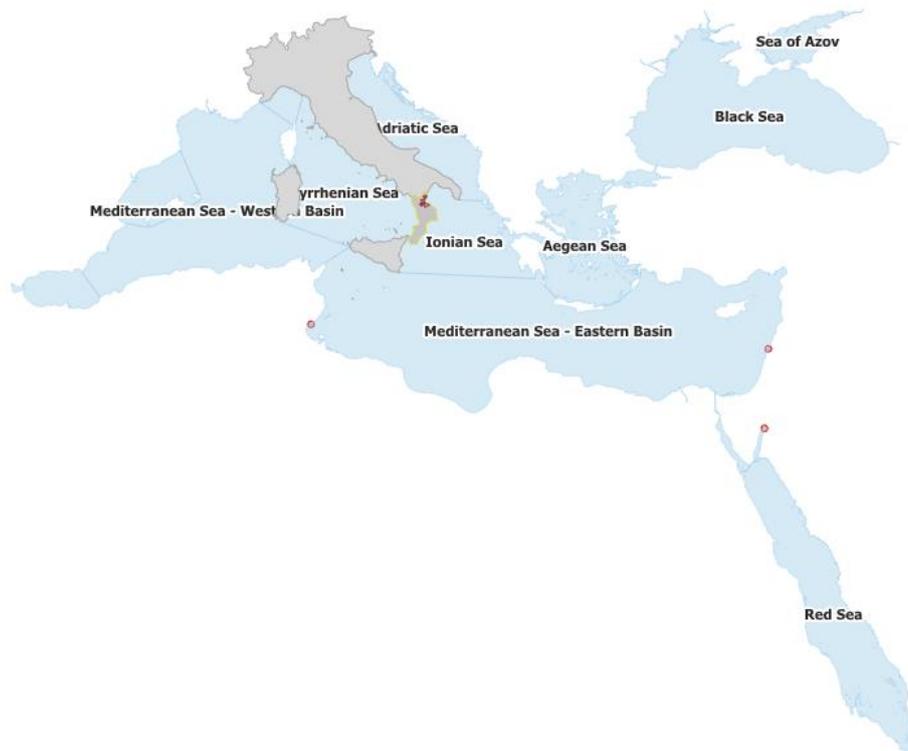
#### 3.1.3.1 Default Map

Upon opening the Italian system within PROGÉS-ISP, a very clear, comprehensive, and clean map of the Mediterranean basin, as well as all the project areas (indicated by red dots), is presented. To align more consistently with the fact that this is solely the Italian system, it may be more appropriate to have an increased default zoom in on the Italian project area. However, the latter is easily distinguishable due to the chosen colours for Italy (light grey), Calabria (dark grey with yellow borders), and the project area itself in red. Such an approach could be used also in other project systems in order to have a standardise default visualisation whenever accessing PROGÉS-ISP.

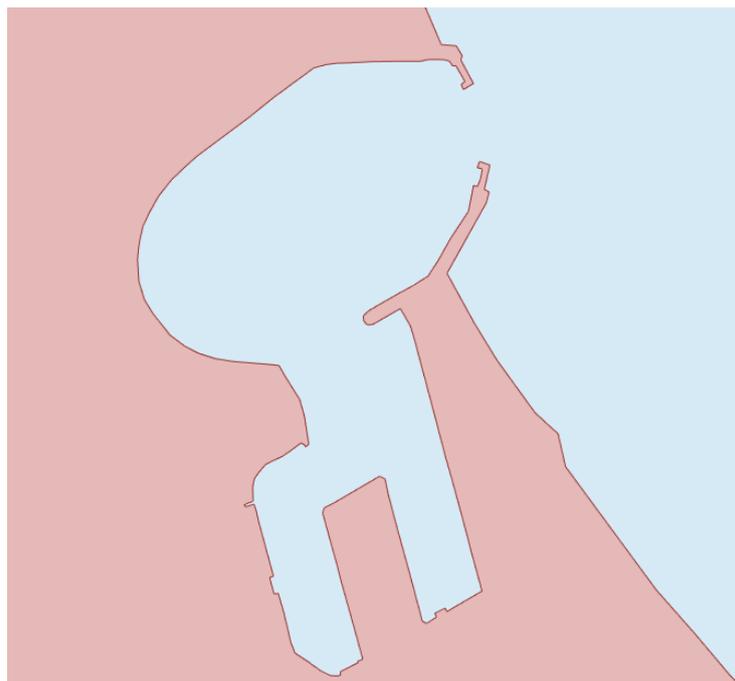
Once zoomed in on the Italian project area, it's possible to conduct a more in-depth evaluation of the digitalisation quality and representatives of GIS vectors used:

- The eleven different municipalities that make up the extensive Italian project area, coinciding with Sibaritide, are clearly visible. A light red colour has been used for the municipality's polygons, and a darker red for the borders.
- A substantial and meticulous effort has been made to align the various layers, thus avoiding gaps, overlapping geometries, and unclicked vertices. All the loaded layers, when visible simultaneously (sea, Italy, Calabria Region, Municipalities vectors), overlap seamlessly without causing any issues. Unfortunately, the only weakness is that the complexity of numerous layers tends to slow down the GIS viewer within PROGÉS-ISP.

- The default view does not display the location of the protected areas of Lake Tarsia and the Crati River Estuary. However, it is both possible and straightforward to activate the layer related to Natura 2000 sites from the Spatial Maps panel. This enables the visualization of geometries pertaining to the protected areas within the project area, which are subject to EBM approach application.



*Default GIS visualisation.*



*A close-up view showcases the digitization of the Port of Corigliano.*

### 3.1.3.2 GIS Vectors

The vectors analysed also serve as the base maps used for the visualization of the majority of the data loaded into the Italian system. Therefore, there is no need for further examination of additional vectors. Beyond these base vectors, there are other point vectors (e.g., bathing watery quality stations, air quality stations) that cannot be assessed due to the absence of customization and digitalisation, as they are solely determined by their coordinates.

### 3.1.4 Data Management Toolbox

The Data Management Toolbox within the Italian system in PROGES-ISP consists of 13 different Data Source items along with 1 item specifically dedicated to GIS vectors, called "Base Maps." Both at the Data Source level and in their respective Target Datasets (where written reports and Excel data for each Data Source are collected), all items are accompanied by description, data collection procedures, data updating procedures, the Excel source file and data providers. Given the diverse types of online data repositories used, each with its formatting, management, and data publication rules, particular attention has been given to describing all the steps for obtaining and processing data, even at the Excel level. This serves two purposes:

- Reading and understanding the data and metadata is immediate, with the ability to trace the data source extremely easily.
- Future data updates are facilitated, including data from more complex and extensive databases. The update procedures are in this way possible even for non-expert users.

According to the enhanced PROGES-ISP tool "DMT to Tabular Db Mapping", 82 out of 87 indicators loaded into the system have a mutual correspondence with items within the Data Management Toolbox. This means that the data has been uploaded inside PROGES-ISP using the correct procedure, by using the 'spreadsheet to Db table' tool. It is suggested to identify the problem and fix the connection for the remaining 5 indicators.

Agricoltura	<u>Ad ogni aggiornamento decennale del <b>Censimento Generale dell'Agricoltura</b>:</u>	ISTAT
Rapporti Censimento Agricolo: 1982, 1990, 2000, 2010, 2020.	1. Estrarre i dati manualmente dalle varie pagine web del <b>portale ISTAT</b> (impostare gli anni sulle righe e non sulle colonne). 2. Inserire i dati estratti in Excel e formattare. 3. Importare i dati nei file Excel nel DB con lo <b>SpreadSheet to Db</b>	Tabelle digitali (e.g. Excel)
Catasto dei rifiuti	<u>Ad ogni aggiornamento annuale del <b>Catasto Rifiuti</b>:</u>	ISPRA
Catasto Rifiuti gestito da ISPRA ambiente.	1. Estrarre i dati manualmente dalle varie pagine web del <b>portale ISPRA</b> . 2. Inserire i dati estratti in Excel, formattare e trasporre gli anni dalle colonne alle righe. 3. Importare i dati nei file Excel nel DB con lo <b>SpreadSheet to Db</b>	Tabelle digitali (e.g. Excel)
Turismo	<u>Ad ogni aggiornamento annuale dei dati sul Turismo:</u>	ISTAT
Strutture Alberghiere, Arrivi/Presenze	1. Estrarre i dati manualmente dalle varie pagine web del <b>portale ISTAT</b> (impostare gli anni sulle righe e non sulle colonne). Nel caso degli Arrivi/Presenze, leggere specifica. 2. Inserire i dati estratti in Excel e formattare. 3. Importare i dati nei file Excel nel DB con lo <b>SpreadSheet to Db</b>	Tabelle digitali (e.g. Excel)
Registro delle Imprese	<u>Ad ogni aggiornamento annuale del <b>Registro delle Imprese</b>:</u>	ISTAT
Registro delle imprese per settori economici ATECO 2007.	1. Estrarre i dati manualmente dalle varie pagine web del <b>portale ISTAT</b> (impostare gli anni sulle righe e non sulle colonne). 2. Inserire i dati estratti in Excel e formattare. 3. Importare i dati nei file Excel nel DB con lo <b>SpreadSheet to Db Table</b> .	Tabelle digitali (e.g. Excel)

*Close-up view of the Italian Data Management Toolbox.*

## 3.2 PP3: JREDS, Jordan

### 3.2.1 System Diagram

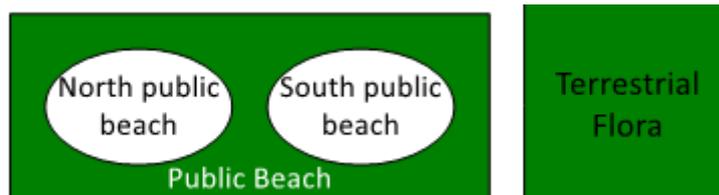
The Jordanian Diagram System is structured into four main categories: the socio-economic sector, coastal infrastructures, fisheries, and living and non-living coastal marine ecosystems. Additionally, a Management Tools component is incorporated to consolidate all identified ecosystem inputs within the system diagram. The system diagram, despite its clear structural delineation into the four primary areas and the additional Management Tools component, is fraught with several issues related to the three criteria identified for its assessment.

#### 3.2.1.1 Clarity and readability

- The four major categories can benefit from a more defined spatial organization, and should be spatially closer (e.g., in **Fauna** category, green components are unjustifiably spread out). This adjustment would allow an enlargement of each component and sub-component, consequently increasing the size and enhancing the readability of the text (text size of the four categories should be increased anyway).
- Components are represented with ovals, rectangles, or circles. Unless there is a specific reason for that choice, it is suggested to standardise their visualisation. Considering the presence of long names for subcomponents, squares with rounded corners are suggested.
- Text size of the arrows should be increased, and their colour should be changed for a better visualisation.
- For some components, the colour used for the name is black, for others the colour chosen is white. It is suggested to standardise the choice of the colour, keeping in mind that white is more readable on a dark green background.



*Example of different subcomponents representation.*



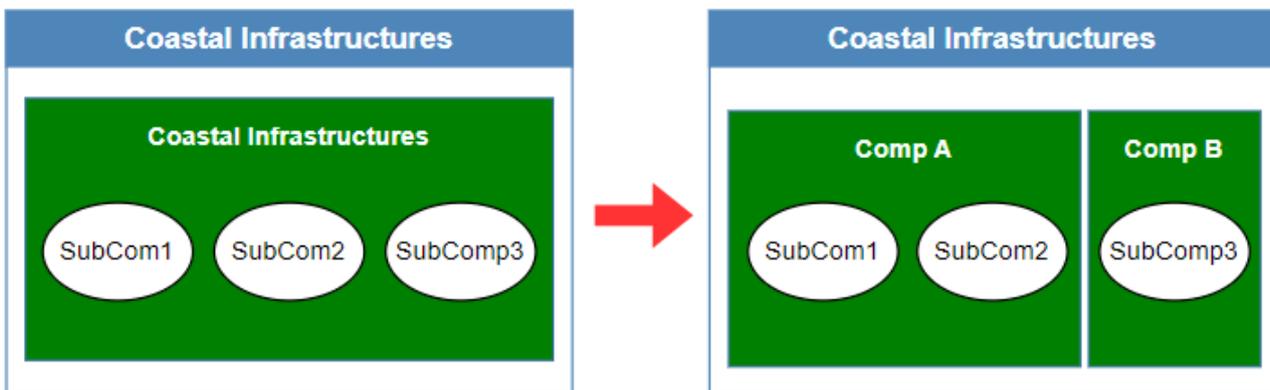
*Example of different colours for components names.*

### 3.2.1.2 *Simplicity and Efficiency*

The system exhibits significant redundancy, characterized by numerous repetitions and unclear component and subcomponent names. In this way, if a user looks at the system diagram, he probably wouldn't know which kind of indicators and data he can expect to find within the components or the subcomponents.

Here some examples of poor Simplicity and Efficiency:

- a. The **Coastal Infrastructure** category has a green component with the same name that contains all the category's subcomponents. To avoid repetitions, it is suggested to remove the green component or to divide the subcomponents in various components with different names.



*Current visualisation scheme and example of proposed visualisation scheme.*

- b. For a user accessing the system, the division of subcomponents in the **Coastal Infrastructures** is dispersive, confusing and it's unclear. Indeed, there are:
  - 6 Terminal subcomponents
  - 4 Marinas subcomponents + 1 Yacht Club subcomponent
  - 7 Ports subcomponents + 1 Old Ports subcomponent
  - 2 Marine Services subcomponents
- c. Some of the subcomponents are repeated in other categories and their difference is not always clear. For example, subcomponents in **Coastal Infrastructure** are comparable with subcomponent "Seaport and Terminals" (Id=5) in **Non-Living Coastal Marine Ecosystem** category.
- d. It is also advisable not to include subcomponents that are actually GIS vectors and will serve as base or reference maps for data visualization. For example, the subcomponent Fishing Sites (Id=66) in **Fisheries** is the reference map of the data that will be uploaded for the other subcomponents in the same category (e.g., to Occupational Fishing). It can't be a subcomponent itself and it is suggested to delete it.

### 3.2.1.3 Data Accessibility

Data accessibility will receive more detailed attention in the following sub-chapter. However, due to the current level of organization that results in some confusion in the system diagram, a non-expert user who has chosen a parameter of interest may have difficulty quickly locating the diagram component containing the relevant data.

As a result of the assessment, it is strongly advised to undergo a substantial overhaul of the whole system diagram and its components. It is suggested to address the revision at the same time with the revision of the indicators. The revision might be time consuming, especially if the decision is made to simultaneously address a rework at Db and PROGES-ISP level with the loading of all tables and views from scratch and a fresh implementation of indicators and metadata (Data Management Toolbox). Such an approach will require a lot of work in the beginning phase, but it will secure the long-term sustainability of the entire system.

## 3.2.2 Indicators, Charts, and Maps

### 3.2.2.1 Socio Economic Sectors



**North area (Id=74) Indicators:**

- Air Quality
- Waste Management
  - No data uploaded.
  - Description, Update Frequency and Data Source not always provided.

*General Component Recommendation:* if possible and according to the data that will be available, a standardisation of indicators is recommended to match with **South Beach (Id=78)** and **Public Beach (Id=85)** over topics such as Water and Air Quality, Waste Management.

**North area (Id=74) Subcomponents Indicators:**

- **Saraya (Id=75)**
  - No indicator identified.
- **Ayla (Id=76)**
  - Ayla Blue Flags
    - Data correctly uploaded.
    - Name of indicator has to be changed to match the data.
    - “Update frequency” field has to be filled according to data.
    - Availability of new data have to be checked (last update: 01-2021).
    - Units have to be added in the chart for all parameters.
    - Map legend has correctly been set for Ammonium values.

- **Five star hotels (Id=77)**
  - Number of visitors
  - Number of beds/rooms
    - No data uploaded.

*General Component Recommendation:* Add Number of presence/arrivals indicator.

\*



**South Beach (Id=78) Indicators:**

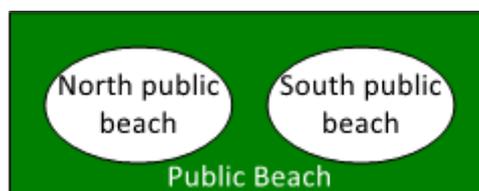
- Number of visitors
- Water Quality
- Waste Management
  - No data uploaded.
  - Description, Update Frequency and Data Source not provided.

*General Component Recommendation:* a standardisation of indicators is recommended to match with **North area (Id=74)** and **Public Beach (Id=85)** over topics such as Water and Air Quality, Waste Management.

**South Beach (Id=78) Subcomponents Indicators:**

- **Barenice (Id=79)**
- **Tala Bay (Id=80)**
- **Beach Hotels (Id=81)**
- **Touristic Resort and Village (Id=82)**
- **Other Resorts (Id=83)**
  - No indicators identified.

\*



**Public Beach (Id=85) Indicators:**

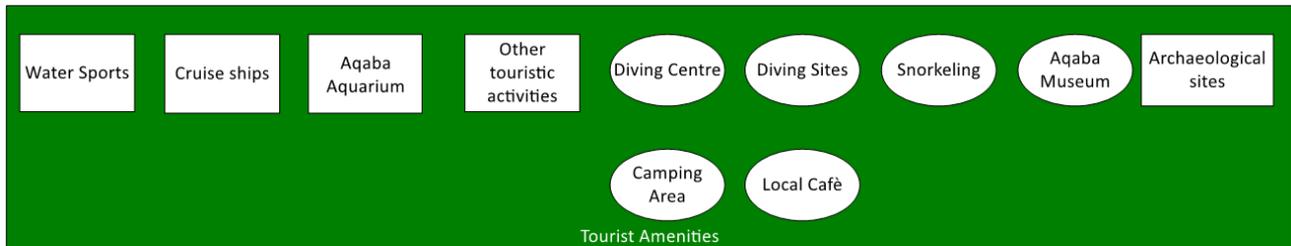
- Water Quality
- Number of fines
  - No data uploaded.
  - Description, Update Frequency and Data Source not always provided.

*General Component Recommendation:* if possible and according to the data that will be available, a standardisation of indicators is recommended to match with **North area** (Id=74) and **South Beach** (Id=78) over topics such as Water and Air Quality, Waste Management.

**Public Beach** (Id=85) Subcomponents Indicators:

- **North public beach** (Id=86)
- **South public beach** (Id=87)
  - No indicators identified.

\*



**Tourist Amenities** (Id=91) Indicators:

- Industrial Diving Activity
  - No data uploaded.
  - Description and Data Source not provided.

*General Component Recommendation:* Connect the indicator “Industrial Diving Activity” either to **Diving Centre** (Id=92) or **Diving Sites** (Id=93) components.

**Tourist Amenities** (Id=91) Subcomponents Indicators:

- **Water Sports** (Id=95)
  - Number of pieces of equipment for each activity
    - No data uploaded.
- **Cruise Ships** (Id=97)
  - N° and type of Cruise Ships
  - N° of Cruise Ships Passengers
  - Stats on Passengers Activities
  - Maintenance of Cruise Ships
    - No data uploaded.
    - Description, Data Source, Update Frequency not always provided.
- **Aqaba Aquarium** (Id=98)
  - Number of visitors
  - Number and species (such as fish and/or coral...)
    - No data uploaded.
    - Description, Data Source, Update Frequency not always provided.

- **Other touristic activities (Id=96)**
  - Number bottom boats
    - No data uploaded.
    - Update Frequency and Data Source not provided.
    - Description to be completed according to future data upload on glass boats.
  
- **Diving Centre (Id=92)**
  - Number of Divers (Users)
    - Data correctly uploaded.
    - Update Frequency and Data Source not provided.
    - Diving Points exist but their spatial GIS location is not provided.
    - Data key not correctly ordered by month.
    - Charts should show labels.
    - Legend should not show underscores.
    - If more data will be gathered, aggregation by year is also suggested.
  - Night Dive Stats.
  - Number of diving boats
  - Number of Certified Diving Centers
    - No data uploaded.
    - Update Frequency and Data Source not provided.

*General Component Recommendation:* Connect this indicator to **Diving Centre (Id=92)** or **Diving Sites (Id=93)**.

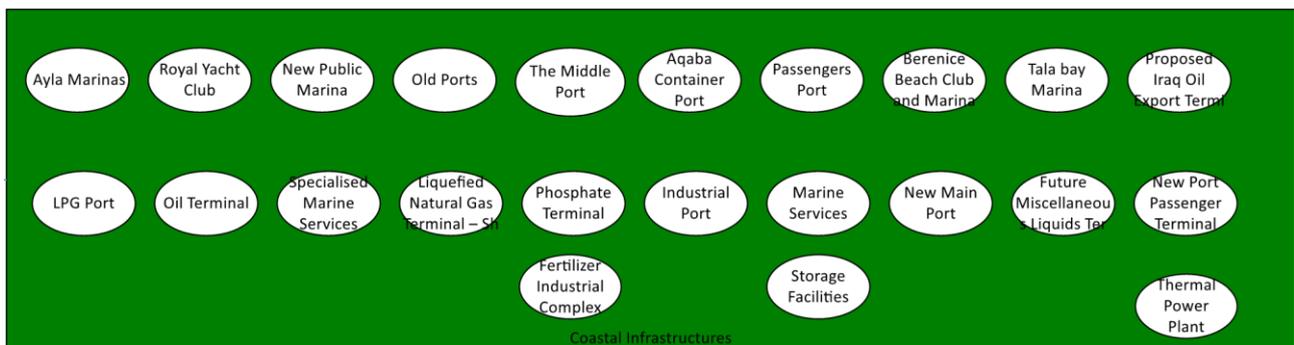
- **Diving Sites (Id=93)**
  - Dive Sites Visitors
    - Data correctly uploaded
    - Description, Update Frequency and Data Source not provided.
    - Type of data meant to be uploaded here not clear.
    - Name of .shp name of diving sites not clear.
    - Data key not correctly ordered by month.
    - Charts should show labels.
    - Legend should not show underscores.
    - If more data will be gathered, aggregation by year is also suggested.
  - N° of Sites
  - Type of Sites
  - Artificial Reefs
    - No data uploaded.
    - Description, Update Frequency and Data Source not always provided.
  
- **Snorkelling (Id=94)**
- **Aqaba Museum (Id=100)**
  - No indicator identified.

*General Component Recommendation:* describe which kind of data are expected to be uploaded here.

- **Archaeological Sites (Id=99)**
  - Location and surface
  - Typology
    - No data uploaded.
    - Description, Update Frequency and Data Source not provided.
  
- **Camping Area (Id=88)**
  - Waste management
  - Surface
    - No data uploaded.
    - Description, Update Frequency and Data Source not provided.
    - Type of data meant to be uploaded here not clear.
  
- **Local Cafè (Id=89)**
  - No indicator identified.

*General Component Recommendation:* describe which kind of data are expected to be uploaded here (could be more effective to extend the subcomponent to all restaurant activities).

### 3.2.2.2 Coastal Infrastructures



**Coastal Infrastructures (Id=9) Indicators:**

- Work force
- Hazardous waste
- Domestic waste
  - No data uploaded.
  - Description and Data Source provided but not the Update Frequency.
  - Indicator should be related to single subcomponent.

*General Component Recommendation:* it is suggested to connect the indicators to more appropriate components or subcomponents.

**Coastal Infrastructures (Id=9) Subcomponents Indicators:**

- **Ayla Marinas (Id=10)**
- **Royal Yacht Club (Id=11)**
- **New Public Marina (Id=12)**
- **Old Ports (Id=13)**
- **The Middle Port (Id=14)**
- **Aqaba Container Port (Id=15)**
- **Passenger Port (Id=16)**
- **Berenice Beach Club and Marina (Id=17)**
- **Tala bay Marina (Id=18)**
- **Proposed Iraq Oil Export Terminal (Id=19)**
- **LPG Port (Id=20)**
- **Oil Terminal (Id=21)**
- **Specialised Marine Services (Id=22)**
- **Liquefied Natural Gas Terminal (Id=23)**
- **Phosphate Terminal (Id missing)**
- **Industrial Port (Id=25)**
- **Marine Services (Id=26)**
- **New Main Port (Id=27)**
- **Future Miscellaneous Liquids Terminal (Id=28)**
- **New Port Passenger Terminal (Id=29)**
- **Fertilizer Industrial Complex (Id=362)**
- **Storage Facilities (Id=363)**
- **Fertilizer Industrial Complex (Id=362)**
- **Thermal Power Plant (Id missing)**
  - No indicators identified.
  - Not always clear the difference between the components (many ports, terminals)

**3.2.2.3 Fisheries**

**Fishing activities (Id=58) indicators:**

- N° of Fishing Licenses
- Fishing Gears
- Landings by Species
  - No data uploaded.
  - Description, Data Source and Update Frequency not always provided.

*General Component Recommendation:* review all the indicators and their Description, Update Frequency and Data Source. Then add the indicators for receiving data from the Fishermen Protocol.

**Fishing activities (Id=58) Subcomponents Indicators:**

- **Occupational Fishing (Id=59)**
  - Fisheries Catch Data (by Species)
    - Data correctly uploaded.
    - Update Frequency and Data Source provided but not the Description.
    - Review Indicator name.
    - Underscore to be removed by Species names in legend.
    - Data key not in the correct order.
    - GIS key not clear.
    - Chart: Total weight line behind the bars.
    - Total weight label missing and to be added.
  - Fisheries Total Catch Data by Day
    - Data correctly uploaded.
    - Update Frequency and Data Source provided but not the Description.
    - Data key not in the correct order.
    - GIS key not clear.
    - Total weight label missing and to be added.
  - Monthly Catch Efforts
    - Data correctly uploaded.
    - Update Frequency and Data Source provided but not the Description.
    - Review Indicator name.
    - Data key not in the correct order.
    - GIS key not clear.
    - Total weight label missing and to be added.
    - Chart visualisation not clear.
  - Fisheries Catch KG/Gear
    - Data correctly uploaded.
    - Update Frequency provided but not the Description and Data Source.
    - Review Indicator name (Kg not KG)
    - Data key not in the correct order.
    - GIS key not clear.
    - Total weight label missing and to be added.
    - Chart visualisation not clear.

*General Component Recommendation:* review all the indicators and their Description, Update Frequency and Data Source. Then add the indicators for receiving data from the Fishermen Protocol. Add also an indicator for “Fisheries Total Catch by Month (Kg)” in order to monitor which are the periods of the year with the most intense activity.

- **Recreational Fishing (Id=60)**
- **Fishing Violations (Id=62)**
  - No indicator identified.



**Occupational Fishing Facilities (Id=63) Indicators:**

- No indicator identified.

**Occupational Fishing Facilities (Id=63) Subcomponents Indicators:**

- **Fisherman Harbour (Id=64)**
- **Fish Markets (Id=65)**
  - No indicator identified.
    - Type of data meant to be uploaded here not clear.

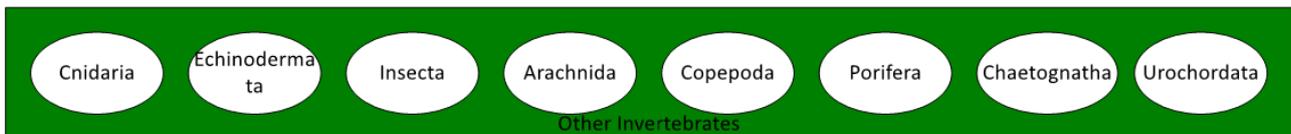
\*



**Fishing Sites (Id=66) indicators:**

- No indicator identified.
  - Type of data meant to be uploaded here not clear (it is a GIS key).

*3.2.2.4 Living (Coastal Marine Ecosystem) - Fauna*



**Other Invertebrates (Id=49) indicators:**

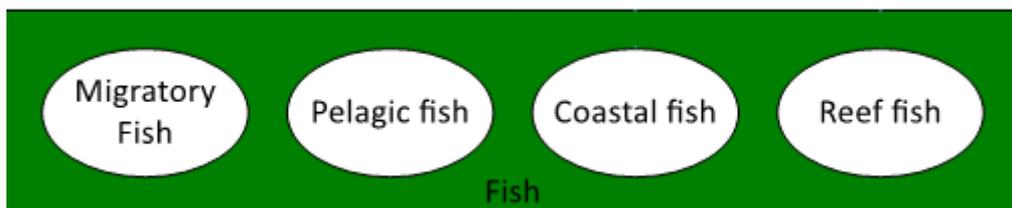
- Invertebrates Reefcheck JREDS
  - Data correctly uploaded.
  - Description and Data Source provided but not the Update Frequency.
  - GIS key not clear.
  - Charts legend not clear.
  - Charts label not clear.
  - Charts visualisation not clear.
  - No GIS map visualisation.

**Other Invertebrates (Id=49) Subcomponents Indicators:**

- **Cnidaria (Id=50)**
  - Jellyfish during spring bloom
    - Data correctly uploaded.
    - Description and Update Frequency provided but not the Data Source.
    - Indicator name to be reviewed (during spring bloom can't be the name)
  
- **Echinodermata (Id=51)**
  - Presence key species
  - Number of individuals of key species
    - No data uploaded.
    - Description, Update Frequency and Data Source not always provided.
  
- **Insecta (Id=52)**
- **Arachnida (Id=53)**
- **Copepoda (Id=54)**
- **Chaetognatha (Id=56)**
- **Urochordata (Id=57)**
  - No indicator identified.
  
- **Porifera (Id=55)**
  - Number of individuals of key species
    - No data uploaded.
    - Data Source provided but not Description and Update Frequency.

*General Component Recommendation:* a standardisation of the indicators for each component is suggested.

\*


**Fish (Id=33) Indicators:**

- Presence of species
  - Data correctly uploaded.
  - Description, Update Frequency and Data Source not provided.
  - Name of species instead of GIS key.
  - Name of species in the GIS key with underscore.
  - Charts legend not clear enough.
  - Charts visualisation not clear.
  - No GIS map visualisation.
  - It is suggested to divide the indicator in three different indicators: one for the endangered status, one for the alien status, one for the commercial status. Moreover, after correcting the

species names misspells, it is suggested to aggregate the species by Class, Order or Family in order to have a better visualisation of the new indicators.

- RED list species
  - No data uploaded.
  - Description, Update Frequency and Data Source not provided.
  - Indicator name not clear.
  - Error when selecting the indicator (the system crashes afterwards).

*General Component Recommendation:* add the indicators related to the Diving protocol.

**Fish (Id=33) Subcomponents Indicators:**

- **Migratory Fish (Id=34)**
- **Pelagic Fish (Id=35)**
- **Coastal Fish (Id=36)**
  - No indicator identified.
  
- **Reef Fish (Id=37)**
  - Fish reefcheck JREDS
    - Data correctly uploaded.
    - Description and Data Source provided but not Update Frequency.
    - Name of indicator contains Data Source (JREDS).
    - GIS key not clear.
    - GIS map visualisation not set up.
    - Charts legend not clear enough.
    - Charts visualisation not clear enough.

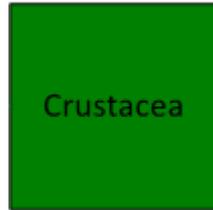
\*



**Birds (Id=30) Indicators:**

- Check list
  - No data uploaded.
  - Description, Update Frequency and Data Source not provided.

\*



**Crustacea (Id=38) Indicators:**

- Check list
  - No data uploaded.
  - Description, Update Frequency and Data Source not provided.

*General Component Recommendation:* add the indicators related to the Diving protocol.

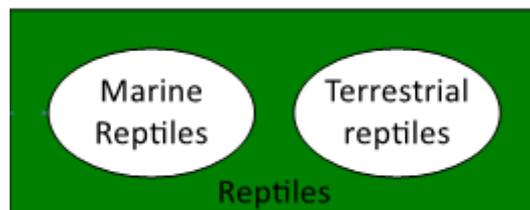
\*



**Mollusca (Id=39) Indicators:**

- Check list
  - No data uploaded.
  - Description, Update Frequency and Data Source not provided.

*General Component Recommendation:* add the indicators related to the Diving protocol.



**Reptiles (Id=40) Indicators:**

- No indicator identified.

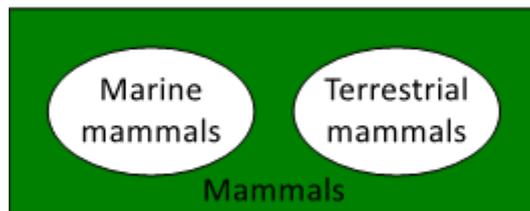
**Reptiles (Id=40) Subcomponents Indicators:**

- **Marine Reptiles (Id=41)**
  - Class age
    - No data uploaded.
    - Description, Update Frequency and Data Source not provided.
    - A unique indicator like this is not useful.

- **Terrestrial Reptiles (Id=42)**
  - Check list
    - No data uploaded.
    - Description, Update Frequency and Data Source not provided.
    - A unique indicator like this is not useful.

*General Component Recommendation:* a standardisation of the indicators for each subcomponent is suggested. Then, indicators related to the Diving protocol should be added.

\*



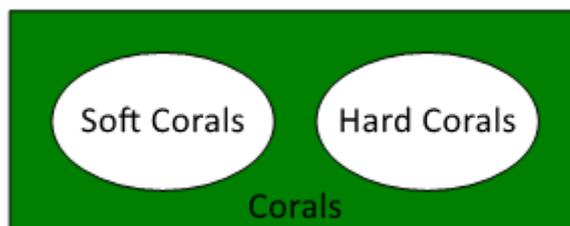
**Mammals (Id=43) indicators:**

- No indicator identified.

**Mammals (Id=43) Subcomponents Indicators:**

- **Marine mammals (Id=44)**
- **Terrestrial mammals (Id=45)**
  - No indicator identified.

\*



**Corals (Id=46) indicators:**

- Impact Reefcheck JREDS
  - Data correctly uploaded.
  - Description, Update Frequency and Data Source provided.
  - Name of the indicator to be improved (JREDS is the provider).
  - GIS key not clear.
  - Charts visualisation not clear.
  - No GIS map visualisation set up.
  - It is suggested to divide the indicator in three different indicators: one for Size of Damage, one for Level of Damage, one for Source of Damage.

- Reefcheck Monitoring Substrate
  - Data correctly uploaded.
  - Update Frequency and Data Source provided, not the Description.
  - Name of the indicator to be improved (JREDS is the provider).
  - Legend not clear.
  - Data uploaded not clear.
  - Charts visualisation not clear.
  - No GIS map visualisation set up.
- Coral status from Marine Habitat Map 2019
  - Data correctly uploaded.
  - Update Frequency and Data Source provided, not the Description.
  - Name of the indicator to be improved (Marine Habitat is the Source).
  - Species names with underscore.
  - GIS key not clear.
  - Charts visualisation not clear.
  - No GIS map visualisation set up.

**Corals** (Id=46) subcomponents indicators:

- **Soft Corals** (Id=47)
  - No indicator identified.
- **Hard Corals** (Id=48)
  - N° of Colonies
  - Status of Colonies
    - No data uploaded.

### 3.2.2.5 *Living (Coastal Marine Ecosystem) - Flora*

**Flora** (Id=74) Box Indicators

- Air Quality
- Waste management
  - No data uploaded.
  - Description, Update Frequency and Data Source not always provided.



**Marine Flora** (Id=69) Indicators:

- No indicator identified.

**Marine Flora (Id=69) subcomponents indicators:**

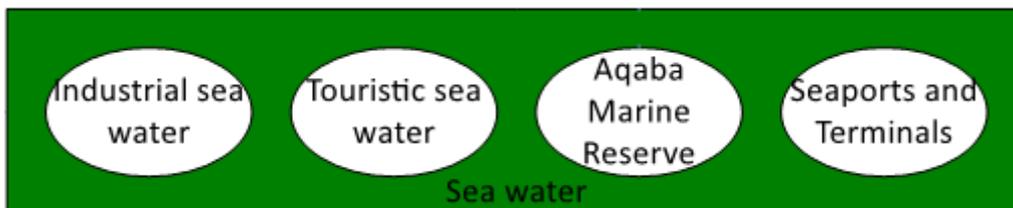
- **Seagrasses (Id=70)**
  - Seagrasses Coverage
    - No data uploaded.
    - Description, Data Source provided but not the Update Frequency.
  
- **CORAL-TURF ALGAE (Id=71)**
  - No indicator identified.
    - Name of indicator with capital letters.
  
- **Macro Algae (Id=72)**
  - Number of Species
    - Description, Update Frequency and Data Source not provided.

\*


**Terrestrial Flora (Id=73) Indicators:**

- Check list of the main species
  - No data uploaded.
  - Description, Update Frequency and Data Source not provided.

### 3.2.2.6 *NON-Living (Coastal Marine Ecosystem)*


**Sea water (Id=1) Indicators:**

- Sea Water Physical Parameters
  - Description, Update Frequency and Data Source provided.
  - Data on:
    - ❖ Temp °C: gives error.
    - ❖ Salinity (PSU): charts visualisation not clear.
    - ❖ Sigma T: gives error.
    - ❖ Transarency: gives error (+ misspell error)
    - ❖ Temp °C 2006-2009: working, repetition to Temp °C?
    - ❖ Transarency: working, but repetition (+ misspell error)

- ❖ Temp2000-2019: working, repetition.
  - It is suggested either to divide the parameters in more indicators, or to work at Db level to merge the same parameters (e.g., Temperature is repeated twice) and keeping them as data series in the same indicator.
  - Review all the charts since they lack information on the legends and in the axis as axis names and labels.
- Total Hydrocarbon
  - Description, Update Frequency and Data Source provided.
  - Data series implemented and connected to table but not shown on charts.
  - It is suggested to review all the steps carried out to connect the indicator to the source table within the Db.
- Bio Geo Chemical Parameters
  - Description, Update Frequency and Data Source provided.
  - Data on:
    - ❖ Nitrate Concentration: working. Axis name to be added.
    - ❖ Nitrite Concentration: gives error.
    - ❖ Ammonium Concentration: working but charts not clear.
    - ❖ Phosphate Concentration: working but charts not clear.
    - ❖ Silicate Concentration: working but charts not clear.
    - ❖ Chl A Concentration: working but charts not clear.
    - ❖ pH: working.
    - ❖ Alkalinity: working.
    - ❖ pH: working but charts not clear.
    - ❖ Dissolved Oxygen: gives error.
  - It is suggested to review and standardise all the parameters charts, using for example the lines. Moreover, axis names have to be added to the charts. It is not clear where the parameters have been surveyed (GIS link?).

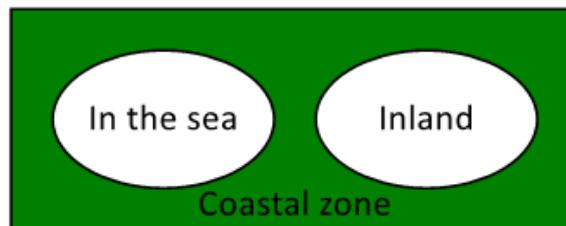
*General Component Recommendation:* Indicators related to the Fishermen protocol and Glass Boat protocol should be added.

**Sea Water (Id=1) Subcomponents Indicators:**

- **Industrial sea water (Id=2)**
  - Microbial Level
    - No data uploaded.
    - Description, Update Frequency and Data Source not provided.
- **Touristic sea water (Id=3)**
  - No indicator identified.
- **Aqaba Marine Reserve (Id=4)**
  - % of Landuse of the Marine Reserve
    - No data uploaded.
    - Description, Update Frequency and Data Source provided.

- Misspell (Landuse)
- Marine Litter
  - Data correctly uploaded.
  - Description, Update Frequency and Data Source not provided.
  - Data key not in order.
  - GIS key not clear and no visualisation on map.
  - Charts label Missing.
- Water Quality CTD
  - Data correctly uploaded.
  - Update Frequency and Data Source provided, not the Description (CTD?)
  - GIS key not clear and no visualisation on map.
- Water Quality SEM
  - Indicator implemented but data not showing.
  - Description provided but not the Update Frequency and Data Source.
- **Seaports and Terminal (Id=5)**
  - ACT water quality
    - Data correctly uploaded.
    - Description, Update Frequency and Data Source provided.
    - Data key not in order.
    - GIS key for map visualisation not set up.
    - Legend set up well, but too many secondary charts.
    - Axis names missing.

\*



**Coastal Zone (Id=6) Indicators:**

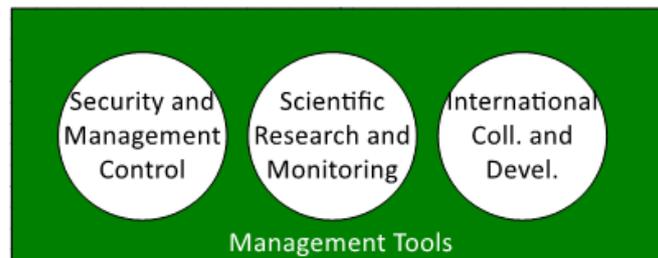
- NMP\_COASTAL
  - Indicator implemented but no data showing.
  - Description, Update Frequency and Data Source not provided.
  - Name of indicator not clear.

**Coastal Zone (Id=6) Subcomponents Indicators:**

- **In the sea (Id=7)**
  - Water Use
    - No data uploaded.
    - Description, Update Frequency and Data Source provided.

- **Inland (Id=8)**
  - Landuse
  - Fossil reef area
    - No data uploaded.
    - Description, Update Frequency and Data Source not always provided.

### 3.2.2.7 Management Tools



#### Management Tools (Id=102) Indicators:

- No indicator identified.

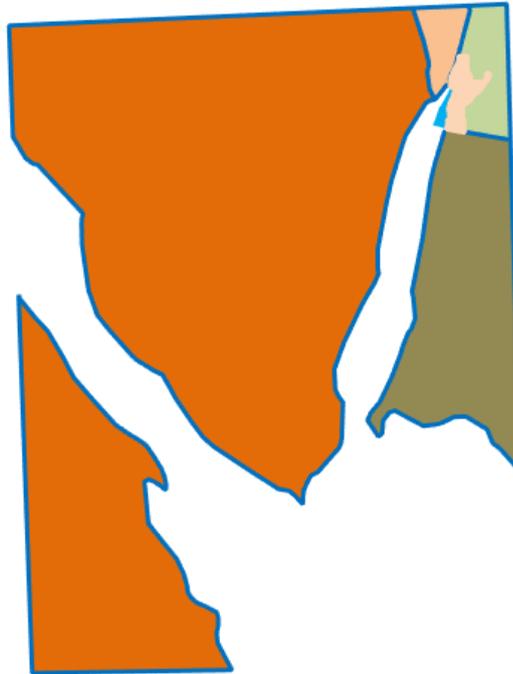
#### Management Tools (Id=102) Subcomponents Indicators:

- **Security and Management Control (Id=375)**
  - Beach violation
    - Data correctly uploaded.
    - Update Frequency and Data Source provided, not the Description.
    - Legend with underscore.
    - GIS key not clear (PBA, VCA).
- **Scientific Research and Monitoring (Id=376)**
  - Reefcheck Monitoring Substrate (daily)
    - Data correctly uploaded.
    - Update Frequency and Data Source provided, not the Description.
    - Legend with underscore.
    - Legend not clear.
    - GIS key not clear.
    - Is it the same data uploaded to the component **Corals (Id=46)**?
  - Reefcheck Monitoring Substrate (monthly)
    - Data correctly uploaded.
    - Update Frequency and Data Source provided, not the Description.
    - Legend with underscore.
    - Legend not clear.
    - GIS key not clear.
    - Is it the same data uploaded to the component **Corals (Id=46)**?
- **International Coll. And Devel. (Id=377)**
  - No indicator identified.

### 3.2.3 GIS Base and Reference Maps

#### 3.2.3.1 *Default Map*

Upon opening the Jordanian system in PROGES-ISP, the default map zooms in on the entire region, lacking specific details for Aqaba or the Aqaba Marine Reserve. It is recommended to address this issue at the GIS level incorporating territorial boundaries for the project area. It is also suggested to revise the colours of the polygons and borders between different countries.



*Default GIS visualisation.*

#### 3.2.3.2 *GIS Vectors*

Concerning the GIS vectors utilized as a reference for data visualization, the preceding sub-chapter revealed frequent ambiguity regarding the vector names and the significance of the acronyms utilized in the legends. The following are the names of the GIS vectors and the accompanying acronyms in the legends that require clarification.

##### **Semwq** (*geometry: points*)

- CC
- MSS
- PB
- Sod
- VC

##### **SEMPRJ** (*geometry: points*)

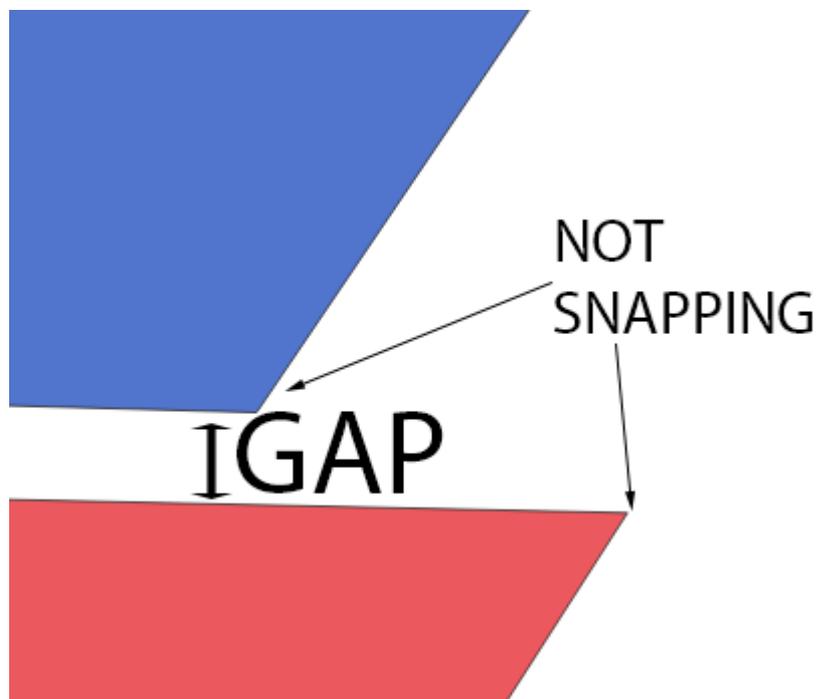
- MSS
- PBA
- CCA
- VCA
- SOD

**Fishzone** (*geometry: polygons*)

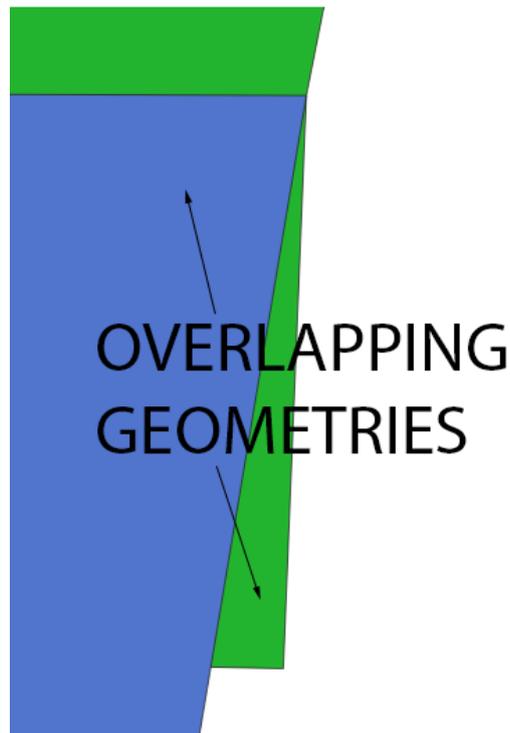
- HA
- GBNPB
- OMP
- OPLB
- OPS
- ACT
- AMR

It is worth mentioning that:

- All the other GIS vectors contains a column with the explanations for the chosen acronyms, but it is only visible when using secondary software like QGIS and accessing the vector's attribute table. Unfortunately, this feature is not accessible on PROGES-ISP. Therefore, it is highly recommended to prepare a document that provides clear explanations for all acronyms used in GIS vectors legend. This document can then be uploaded into the Data Management Toolbox to be available for all the users.
- There are several mistakes in the digitalisation of the polygons GIS vectors. A work on refining and correcting geometries is suggested. This is especially true for the Fishing Zone vector, where overlapping geometries and unsnapped vertices are present. Furthermore, after discussions with the local technical team, it emerged that many of the fishing zones (e.g., Aqaba Marine Reserve and ACT) should be situated 300 meters from the coastline. However, in the GIS vector this value currently varies considerably, ranging from 200 to 400 meters.



*Example of errors in digitalisation in Fishing Zone vector.*



*Example of overlapping in in Fishing Zone vector.*

#### 3.2.4 Data Management Toolbox

The Data Management Toolbox within the Jordanian system is composed of 12 primary items, with an additional item dedicated to GIS vectors called “shapefiles” and another for system matrices. General assessment of the repository:

- The section on System Matrices currently does not contain any data.
- “NMP Water Quality” data is repeated twice: one for data spanning from 2000 to 2005 and another for data from 2006 to 2019. These two data sources should be merged into a cohesive source with two different target datasets.
- A lack of alignment between topic names, their corresponding content in the target datasets section, and the components of the system diagram. Generally, there should be correspondence between the names of categories, components and subcomponent in the system diagram and the data source items in the DMT. This misalignment needs to be addressed for clarity and coherence.
- Descriptions within the toolbox are often missing or insufficient. It is essential to provide comprehensive details regarding data collection procedures for both data sources and target datasets. Furthermore, there is a lack of information on how data updates will be handled.
- According to the tool “DMT to Tabular DB Mapping”, just 18 out of 58 indicators (tables or views) appended to the System Diagram components or subcomponents, have a mutual correspondence with any items within the Data Management Toolbox main repository. This means that the data was often loaded directly into the Db without performing the correct data loading procedure with the 'spreadsheet to Db table' tool inside the Data Management Toolbox.

### 3.3 PP4: TCNR, TUNISIA

The assessment of the Tunisian system was mainly carried out during a series of System Cause-Effect Analysis review meetings led by UNDP consultant Francesca Pella. The review work of the System Cause-Effect Analysis was indeed conducted with the support of the software PROGES-ISP. This facilitated a thorough evaluation of the main components of the system diagram, GIS vectors used, and the most relevant indicators implemented in the system. Moreover, an assessment of the Data Management Toolbox was performed.

#### 3.3.1 System Diagram

The Tunisian system diagram comprises five distinct categories: ecosystem, infrastructures, Aquatic and Terrestrial Fauna, Socio-Economic Sectors, and Weather. It is possible to analyse the system according to the three criteria outlined in the "Methodology" chapter.

##### 3.3.1.1 *Clarity and readability*

The system is well-structured into five distinct categories, each with its own components and subcomponents. The diagram is pleasant to read and navigate, and therefore, there is no need for any general revisions. If necessary, only minor adjustments not related to the content but to their graphic presentation can be made to enhance it in some aspect:

- Standardize the colour of component names (sometimes they are written in white, sometimes in black). However, the choice of using different colours (e.g., red) for the most relevant components is interesting.
- Standardize the colour of components: various shades of green have been used in the system diagram.
- Rearrange some components and subcomponents spatially for a more organized and visually pleasing representation.
- Consider bringing the area on the left side of the diagram closer to the categories on the right side, allowing the entire system to fit on a single screen for improved usability.

##### 3.3.1.2 *Simplicity and Efficiency*

In terms of simplicity and efficiency, the Tunisian system diagram is very well-executed. It is the clear result of meticulous and collaborative ecosystem context analysis work carried out with the support of stakeholders and experts from various fields. It is evident that the selection of each component, as well as the relationships that connect them, has been considered and reasoned. Even though the complexity of the ecosystem is well represented, the system is clear and straightforward, free from repetitions, and the components and sub-components are sufficient in number, and so without redundancy, to describe the ecosystem in its entirety.

This ensures that all users, including those less experienced who did not participate in the system's implementation, are able to grasp the peculiarities of the target area once the system diagram is opened.

### 3.3.1.3 Data Accessibility

Thanks to the understandable structure of the system diagram, its simplicity, and the clarity and uniqueness of the selected components, it is possible to access the desired information easily. Indeed, there is a correspondence between individual components and subcomponents with the indicators and data loaded within them. This, coupled with the quality of data presentation in the chosen and implemented indicators within the system (as it will be described in the next chapter), serves as an asset in terms of the system's robustness. Moreover, this clarity contributes to its effectiveness in sharing findings and insights with the broader audience. Overall, the system will turn out to be accessible and comprehensible to a wide range of stakeholders, without compromising the scientific foundation of the data uploaded.

### 3.3.2 Indicators, Charts, and Maps

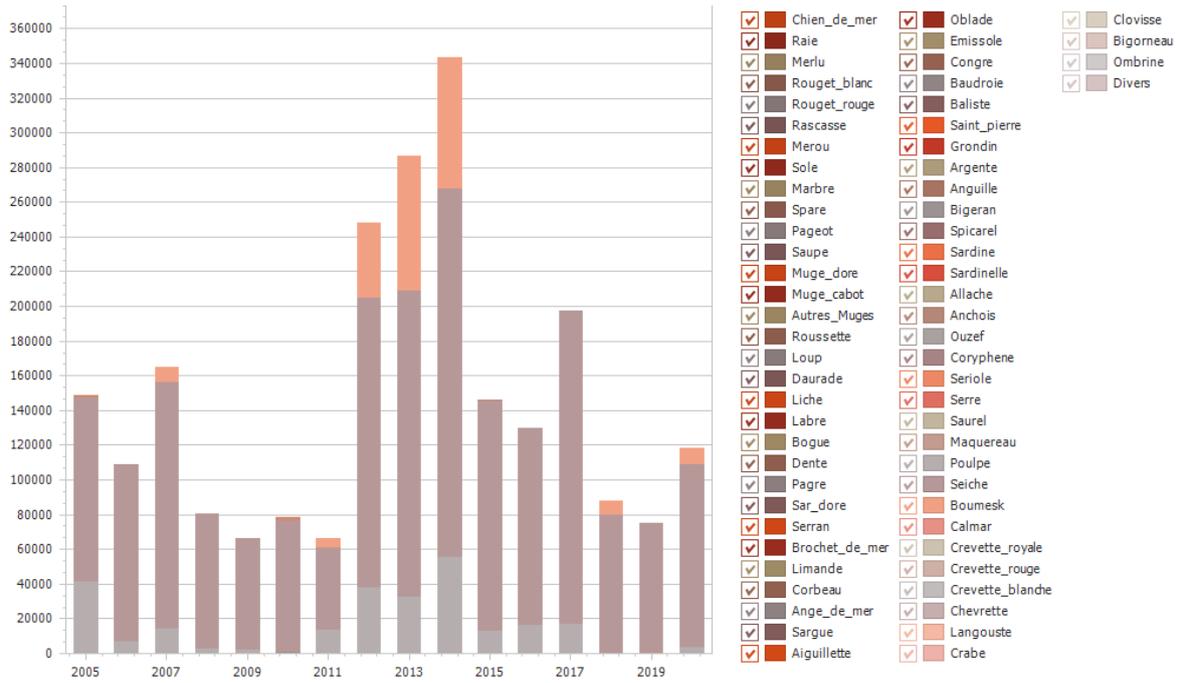
The work carried out during the ecosystem context analysis did not stop at identifying ecosystem components and relationships to organize in a system diagram. In fact, nearly all the boxes, components, and subcomponents of the Tunisian system diagram feature one or more indicators. The selection of these indicators is also the result of selection work, ensuring that the quality and quantity standards for applying the EBM approach in a coastal area are met. In terms of quantity, the selected indicators adequately represent the relevant ecosystem dynamics of the project area. Furthermore, they are not excessive in number, thereby avoiding overburdening the system with unnecessary information. In terms of quality, the analysis over the indicators can be divided in four parts:

- a. **Consistency with the system diagram:** they are indicators that correspond to the component or subcomponent in which they have been loaded. Once an information is needed to assess the ecosystem, it is easy to identify the component of the diagram where the data can be found.
- b. **Quality of implementation:** every indicator has a clear and representative name. Although this is often sufficient and exhaustive, indicators are always accompanied by a comprehensive and in-depth description, data source and the update frequency. It is crucial to emphasize that the information is provided even when the indicators do not have data yet. This is highly important in the context of future system implementation, where new data will be added. New data will already have a well-defined structure and framework which will be ready to receive them.

Name	Description	Updat...	Data Source	Notes
Area of wetlands (Ha)	Surface of all the different types of wetlands. In Ha. Note: Morzadec-Kerfourn (2002) and Bouaziz (2011) identified in the wetlands four different habitats, called sebkhas (salted land without vegetation), chotts (salted land with salt-tolerant vegetation), tidal marshes, and lagoons.	Annual	DGF (Forest Department) APAL	Source: APAL

*Example of indicator description even being without data.*

- c. **Quality of charts visualisation:** All indicators that present data have a clear, clean, and effective data visualization. The construction of the charts has been well executed using all the various options provided by PROGÉS-ISP in the Data Series panel. Moreover, a subdivision of the charts in the Time Scales panel within the same indicator has been carried out to achieve cleaner outputs, avoiding clutter from too many items (e.g., Catch by group indicator in Fisheries component). This results in a robust work that allows for the use of outputs both for assessment of ecosystem dynamics and for disseminating results with the stakeholders.



Example of clear chart visualisation.

- a. **Quality of maps visualisation:** Where possible, the map visualization has been configured with the correct spatial key, which is linked to a GIS vector, and a colour legend. There are no issues whatsoever with the data visualization.

### 3.3.3 GIS Base and Reference Maps

#### 3.3.3.1 Default Map



#### *Default GIS visualisation.*

Once the Tunisian system is opened within PROGÉS-ISP, there is one GIS vector with the map of the entire Tunisia. The local team has decided not to include any reference directly leading to the location of the Kneiss Islands. This can be a problem, considering the limited territorial extent of the target area, for external users who may want to identify the geographical location where the EBM approach is applied. It might be advisable to produce even an expeditive digitization of the Kneiss Islands for use as a visual reference to the target area's location whenever the Tunisian system is opened.

#### 3.3.3.2 GIS Vectors

All the other GIS vectors used in the system as base map for data visualisation do not present any kind of issue, except for the ones related to the extensive presence of mudflats in the area, which made it challenging to digitize the terrestrial lands and distinguish them from water. For this reason, there may be discrepancies in the digitization of the different layers, but these are fully accepted.

#### 3.3.4 Data Management Toolbox

The Data Management Toolbox of the Tunisian system within PROGÉS-ISP consists of 5 different Data Sources plus an additional one called "SHAPE FILES," which contains the GIS vectors used in the project. The repository is presented in a clear and organized manner, with each data source having a name that is sufficiently descriptive of the tables contained within them. Furthermore, each Data Source includes the necessary information in terms of description, data collection procedure, data provider, data type. Some of the metadata could be more detailed in terms of procedures for refining the source excel tables or with the future procedures for updating the existing Db tables. At this date, most of this information are provided in English, while a few are only in French. It would be helpful to have translations into English for the latter.

According to the tool "DMT to Tabular Db Mapping", 67 out of 78 indicators loaded into the system have a mutual correspondence with items within the Data Management Toolbox. This indicates that the data has been mainly uploaded into PROGÉS-ISP using the correct procedure, using the 'spreadsheet to Db table' tool. It is suggested to fix the 11 unmatched indicators in order to have a complete correspondence between the two interfaces.

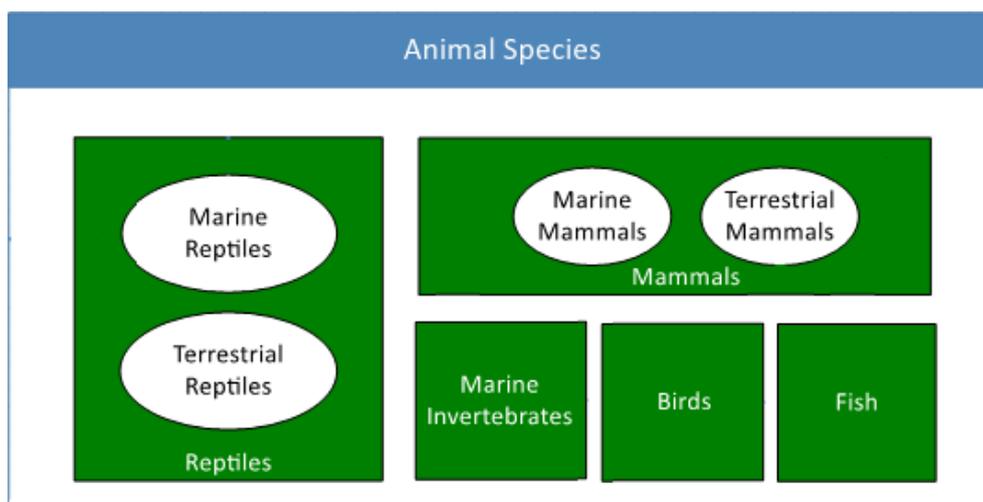
### 3.4 PP5: TCNR, Lebanon

#### 3.4.1 System Diagram

The Lebanese system diagram is composed of five different areas, in which the related components and subcomponents are stored: Socio Economics Aspects, Plant Species, Biophysical System, Animal Species, Coastal Infrastructures. The organization of the four main categories within the content is well-structured in terms of spatial arrangement. However, there is room for improvement in the readability and overall presentation of the green components and their sub-components. To enhance and improve the overall readability the next steps are suggested according to the criteria identified.

##### 3.4.1.1 Clarity and readability

- It's advisable to bring spatially closer components which, as in the case of the **Animal Species** category, are unjustifiably scattered. By implementing this change, the system diagram can become more user-friendly, even when viewed on smaller screens. It can be displayed within a single screen, eliminating the necessity to zoom in and out or navigate in all four directions to access all the included information.



*Example of Animal Species Category re-drawing.*

- It is advisable to increase the dimension of each component and sub-component, by using standardised shape and size which in the actual system diagram has not been adopted yet (now different types of ovals are being used for subcomponents).
- Components and subcomponents with similar content should have the same height and width (e.g., squares or ovals with names of similar length).
- As a result of the previous point, which served to create larger containers, it is recommended to enlarge the text size of all components and subcomponents.
- It is advisable to use the same colour for items belonging to the same category (**Fisheries** and **Local Community** components have a different colour).



*Example of components different in eight and colour.*

### 3.4.1.2 *Simplicity and Efficiency*

It is advisable to avoid repetitions. For example, there are Hotels (Id=38) and Restaurants (Id=39) subcomponents in **Tourism** (Id=36) component that are similar to the component **Hotels and Restaurants on the coastal line**. It is supposed that the first two subcomponents include the data expected to be uploaded in the third component, considered also the fact that Tyre is a city on the sea.

### 3.4.1.3 *Data Accessibility*

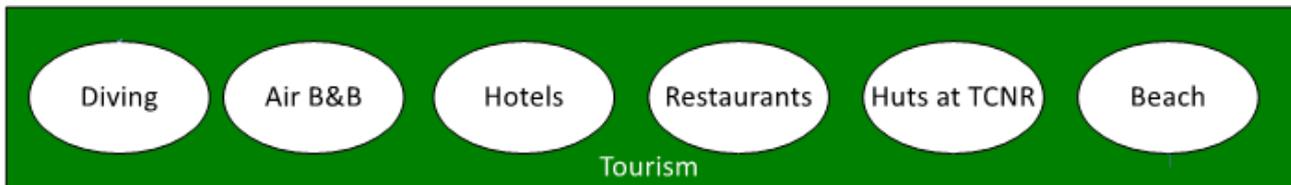
Currently, there is a minimal amount of data loaded into the system, as it will be explored further in the upcoming sub-chapter. However, the approach of dividing the components and often assigning identical names to the sub-components could be a good strategy. However, it's essential to keep in mind that this approach will require an extensive effort to partition and load the source data tables in alignment with the components and their corresponding target indicators.



*Example of components with repeated subcomponents.*

### 3.4.2 Indicators, Charts, and Maps

#### 3.4.2.1 *Socio Economic Aspects*



#### **Tourism** (Id=36) indicators:

- No indicator identified.

#### **Tourism** (Id=36) Subcomponents Indicators:

- **Diving** (Id=1108)
  - No indicator identified.
- **Air B&B** (Id=37)
  - N° of Costumers
  - Number of beds
    - No data uploaded.
    - Description, Update Frequency and Data Source provided.
- **Hotels** (Id=38)
  - N° of Costumers
    - No data uploaded.
    - Description, Update Frequency and Data Source provided.
  - Number of beds
    - Data correctly uploaded.
    - Description, Update Frequency and Data Source provided.
    - Check data with legend (which says Number of Rooms)
    - Check legend meaning of “Level of Impact from Crisis)
    - Add labels to chart bars.
- **Restaurants** (Id=39)
  - Number of employees
    - Data correctly uploaded.
    - Description, Update Frequency and Data Source provided.
  - Number & Type of restaurants
  - Size of restaurant
    - No data uploaded.
    - Description, Update Frequency and Data Source provided.
    - Data can be retrieved from the source table.

- **Huts at TCNR (Id=40)**
  - Number of tourists visiting the huts (49 huts)
  - Workforce
    - No data uploaded.
    - Description, Update Frequency and Data Source provided.
  
- **Beach (Id=41)**
  - # tourists
    - No data uploaded.
    - Description, Update Frequency and Data Source provided but to check.
    - Name of indicator to be reviews.

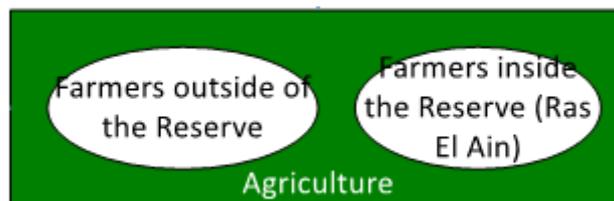
\*



**Fisheries (Id=1104) indicators:**

- Economic value (\$/125 m2) of local fish
- Catch (tons)
- Economic value (\$/Kg) of imported fish
  - No data uploaded.
  - Description provided, not the Update Frequency and Data Source

\*



**Agriculture (Id=42) Indicators:**

- Area (ha) of crops
- Typology of crops
- Economic value of each crop
- Production (tons)
- Use of synthetic agrochemical products
- Greenhouses (surface)
- Surface of conventional or organic farms
- Agriculture as% GDP
  - No data uploaded.
  - Description, Update Frequency and Data Source not always provided.

*General Component Recommendation:* review the indicators names for a better representativeness of the data expected to be uploaded.

**Agriculture (Id=42) Subcomponents Indicators:**

- **Farmers outside the Reserve (Id=43)**
  - No indicator identified.
    - Data to be uploaded not clear.
  
- **Farmers inside the Reserve (Ras El Ain) (Id=44)**
  - No indicator identified.
    - Data to be uploaded not clear.

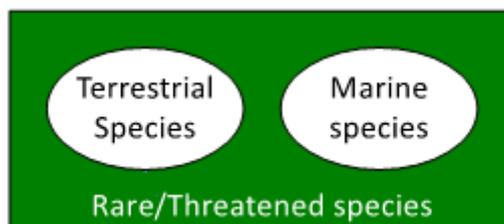
\*



**Local Community in TCNR Biosphere (Id missing) Indicators:**

- No indicator identified.

3.4.2.2 *Plant Species*

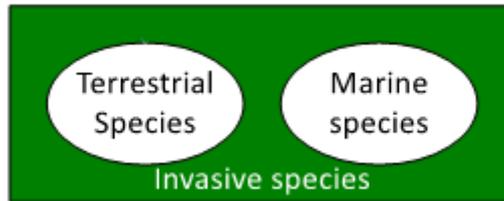


**Rare/Threatened species (Id=27) Indicators:**

- No indicator identified.

**Rare/Threatened species (Id=27) Subcomponents Indicators:**

- **Terrestrial species (Id=28)**
  - Presence of Salsola kali
  - Cover of Salsola kali
    - No data uploaded.
    - Description, Update Frequency, Data Source not always provided.
  
- **Marine species (Id=29)**
  - No indicator identified.



**Invasive species (Id=32) Indicators:**

- No indicator identified.

**Invasive species (Id=32) Subcomponents Indicators:**

- **Terrestrial species (Id=33)**
  - Presence of Heterotheca subaxillaris
    - No data uploaded.
    - Description, Update Frequency, Data Source not provided.
- **Marine species (Id=34)**
  - No indicator identified.

\*



**Endemic species (Id=30) Indicators:**

- No indicator identified.

**Endemic species (Id=30) Subcomponents Indicators:**

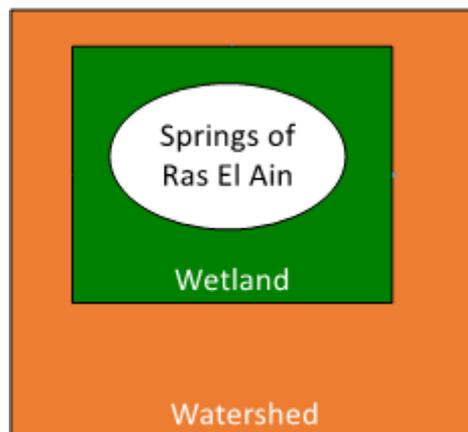
- **Terrestrial species (Id=31)**
  - Presence of Astragalus beritheus
    - No data uploaded.
    - Description, Update Frequency, Data Source not provided.
  - Cover of A. beritheus
    - No data uploaded.
    - Description, Update Frequency, Data Source not provided.
    - Name of species in the indicator name to be standardized.



**Other species (Id=35) Indicators:**

- No indicator identified.

3.4.2.3 *Biophysical System*



**Watershed (Id=1117) Box Indicators:**

- Residues of Nitrates
- Salinity
- Residues of pesticides
  - No data uploaded.
  - Description, Update Frequency and Data Source provided.

**Wetland (Id=10) Indicators:**

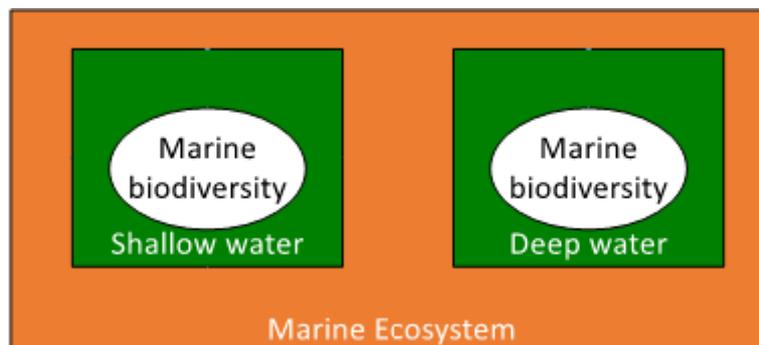
- No indicator identified.

**Wetland (Id=10) Subcomponents Indicators:**

- **Springs of Ras El Ain (Id missing)**
  - Water Quality Data
  - Nitrite Concentration
  - Phisical Concentration
    - Data correctly uploaded.
    - Description, Update Frequency and Data Source provided.

- Sodium Concentration
- Calcium Concentration
- Magnesium Concentration
- Potassium Concentration
- Nitrate Concentration
- Sulfate Concentration
- Chloride Concentration
- Fluoride Concentration
- Bromide Concentration
- Lead Concentration
- Chromium Concentration
- Copper Concentration
- Zinc Concentration
- Iron Concentration
- Manganese Concentration
  - Data correctly uploaded.
  - Description, Update Frequency and Data Source provided.
  - Working but error related to string format.

\*



**Marine Ecosystem (Id=1012) Box Indicators:**

- Algae bloom
  - No data uploaded.
  - Description, Update Frequency and Data Source provided.

**Shallow water (Id=14) Indicators:**

- No indicator identified.

**Shallow water (Id=14) Subcomponents Indicators:**

- **Marine Biodiversity (Id=15)**
  - Presence Seagrass Cymodocea nodosa
  - Cover Seagrass C. nodosa
    - No data uploaded.
    - Description, Update Frequency and Data Source provided.

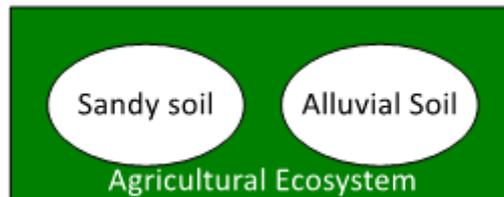
**Deep water (Id=17) Indicators:**

- No indicator identified.

**Deep water (Id=17) Subcomponents Indicators:**

- **Marine Biodiversity (Id=18)**
  - No indicator identified.

\*



**Agricultural Ecosystem (Id=19) Indicators:**

- No indicator identified.

**Agricultural Ecosystem (Id=19) Subcomponents Indicators:**

- **Sandy soil (Id=20)**
- **Alluvial Soil (Id=21)**
  - No indicator identified.

\*



**Sand Beach (Id=13) Indicators:**

- Litter presence transported by sea.
- Presence of litter left by tourists.
  - No data uploaded.
  - Description, Update Frequency provided, not Data Source.

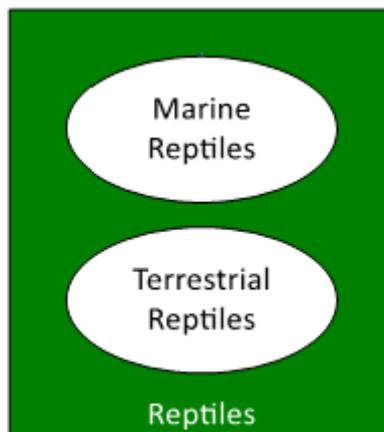
*General Component Recommendation:* add the data available for these two subcomponents and that have already been discussed with the local team.



**Sand Dune Ecosystem** (Id=12) Indicators:

- No indicator identified.

3.4.2.4 *Animal Species*

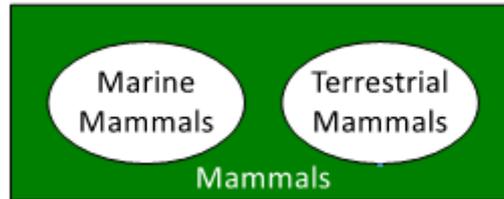


**Reptiles** (Id=5) Indicators:

- No indicator identified.

**Reptiles** (Id=5) Subcomponents Indicators:

- Marine Reptile (*Id missing*)
- **Terrestrial Reptiles** (*Id missing*)
  - No indicator identified.



**Mammals (Id=1) Indicators:**

- No indicator identified.

**Mammals (Id=1) Subcomponents Indicators:**

- Marine Mammals (Id=2)
- Terrestrial Mammals (Id=3)
  - No indicator identified.

\*



**Birds (Id=4) Indicators:**

- National rarity
- Rarity
- Vulnerability
- Occurrence
  - No data uploaded.
  - Update Frequency and Data Source provided, not the Description.

\*



**Marine Invertebrates (Id=8) Indicators:**

- No indicator identified.



Fish

**Fish** (Id=6) Indicators:

- No indicator identified.

#### 3.4.2.5 *Coastal Infrastructure*



Hotels and  
Restaurants  
on the  
coastal line

**Hotels and Restaurants on the coastal line** (Id missing) Indicators:

- No indicator identified.

\*



Tyre  
fishermen  
port

**Tyre fishermen port** (Id=22) Indicators:

- No indicator identified.

\*



Palestine  
refugee  
camp.

**Palestine refugee camp.** (Id missing) Indicators:

- No indicator identified.

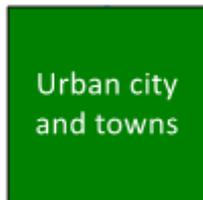
\*



**Stone ponds** (Id missing) Indicators:

- No indicator identified.

\*



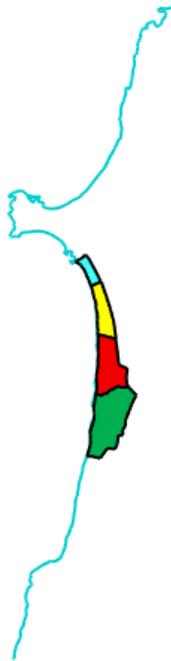
**Urban city and towns** (Id=26) Indicators:

- Sewage network
- Quantity water in the network
- Waste water treatment
- Treatment plant
  - No data uploaded.
  - Data Source provided, not the Description and Update Frequency.

### 3.4.3 GIS Base and Reference Maps

#### 3.4.3.1 *Default Map*

When accessing the Lebanese system in PROGES-ISP, it automatically displays the default map of Tyre area with an appropriate zoom level. However, there is room for improvement in distinguishing between the sea and land, which is currently represented by a simple blue line. This enhancement can be easily accomplished by incorporating a polygon outlining the sea or by including a polygon outlining the territorial boundaries of Tyre municipality. The TCNR polygon is currently segmented into four coloured areas, but their significance is not readily apparent. For this initial basic visualization, it might suffice to represent the entire TCNR polygon using a single colour.



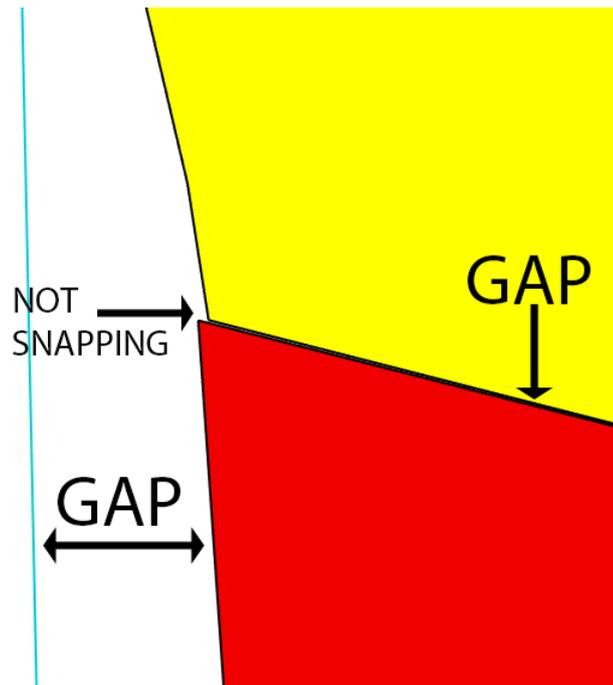
*Default GIS visualisation.*

#### 3.4.3.2 GIS Vectors

In the attempt to access and analyse the GIS files used in the Lebanese system, two problems arose:

- Downloading the GIS vectors from the DMT repository proved to be unsuccessful. Consequently, the GIS vectors have been searched in local machine folders, where they are automatically downloaded by the system every time the access on PROGÉS-ISP is performed. Unfortunately, all GIS vectors are lacking the crucial .shx file extension. This file serves as the index for feature geometry, an essential component for correctly importing the vector data into any GIS software. Due to the absence of this file, it was impossible to conduct a more in-depth analysis of the GIS vectors. It is strongly recommended to retrieve all the necessary files used for the project.

A quick analysis was only feasible on the vector data provided on the default map within PROGÉS-ISP. During this assessment, it was observed a notably imprecise digitization process. This inaccuracy is evident in several aspects, including the TCNR polygons' boundaries not aligning accurately with the coastline, misalignment of different TCNR zones, the presence of gaps, and a lack of snapping. To address these issues, it is highly advisable to conduct a comprehensive review of the entire digitization process in collaboration with the local team.



*Problems of digitalisation.*

#### 3.4.4 Data Management Toolbox

Given the limited amount of data loaded into the system, the Data Management Toolbox within the Lebanese system is composed of 6 primary items, with an additional item dedicated to GIS vectors called “SHAPE FILES” from which, however, it is not possible to download vectors. In preparation for the upcoming technical implementation of the system and the progress it will bring, the recommendation is to review the section related to shapefiles and begin creating data sources based on the data themes that will be loaded. It will be essential to keep track of the data source origins, data collection procedures, and procedures for future data updates, if applicable.

It is essential to emphasize that, according to the tool “DMT to Tabular Db Mapping”, all 28 indicators loaded into the system have a mutual correspondence with items within the Data Management Toolbox. This indicates that the data has been uploaded into PROGES-ISP using the correct procedure, using the 'spreadsheet to Db table' tool.

## 4. System Technical Refinement and Enhancement

### 4.1 PP3: JREDS, Jordan

#### 4.1.1 DB and PROGES-ISP Enhancement

##### Occupational Fishing (Id=59)

- “Monthly Catch Efforts” → Indicator name changed to “Fisheries Total Catch by Year/Month (Kg)”
  - The choice was made to more accurately reflect the level of aggregation of the DB table (dbo.Catch\_efforts) from which the data are retrieved for this indicator. Indeed, the table has a YYYY/MM format.
  - To represent the monthly level of aggregation, as it will be described in this document, a new indicator named "Total Fisheries Catch by Month (Kg)", where data will be aggregated solely by month, without considering the year, has been created instead.
- “Fisheries Total Catch by Year/Month (Kg)” → resetting of GIS map legend with the division into more representative classes (five instead of nine classes) and the use of a single colour gradient (red scale).
- “Fisheries Catch Data (by Species)” → Indicator named changed to “Fisheries Species Catch by Year/Month (Kg)”
  - The decision was made to standardize the indicator name with the other indicators’ names in the same component.
- “Fisheries Species Catch by Year/Month (Kg)” → resetting of GIS map legend with the division into more representative classes (five instead of nine classes) and the use of a single colour gradient (red scale).
- “Fisheries Species Catch by Year/Month (Kg)” and “Fisheries Species Catch by Year/Month (Kg)” → Reordering of chronological YYYY/MM display.
  - In the data key of the charts of the two indicators, the YYYY/MM were not shown in chronological order, causing confusion and lack of clarity when reading the charts. The problem has been corrected at the level of the Db table (dbo.Fisheries\_Catch\_JREDS), where for the months of 2021 and 2022, the numbers between 0 and 9 do not have a 0 in front. A query ([Annexes: Query01](#)) has performed to update the table and the related views.
- “Fisheries Total Catch Data by Day” → Indicator name changed to “Fisheries Total Catch by Year/Month/Day (Kg)”
  - The decision was made to better represent the level of data aggregation, which follows the YYYY/MM/DD format, and to standardize it with the other indicators’ names in the same component.
- “Fisheries Total Catch by Year/Month/Day (Kg)” → Axis name “Kg” has been added.

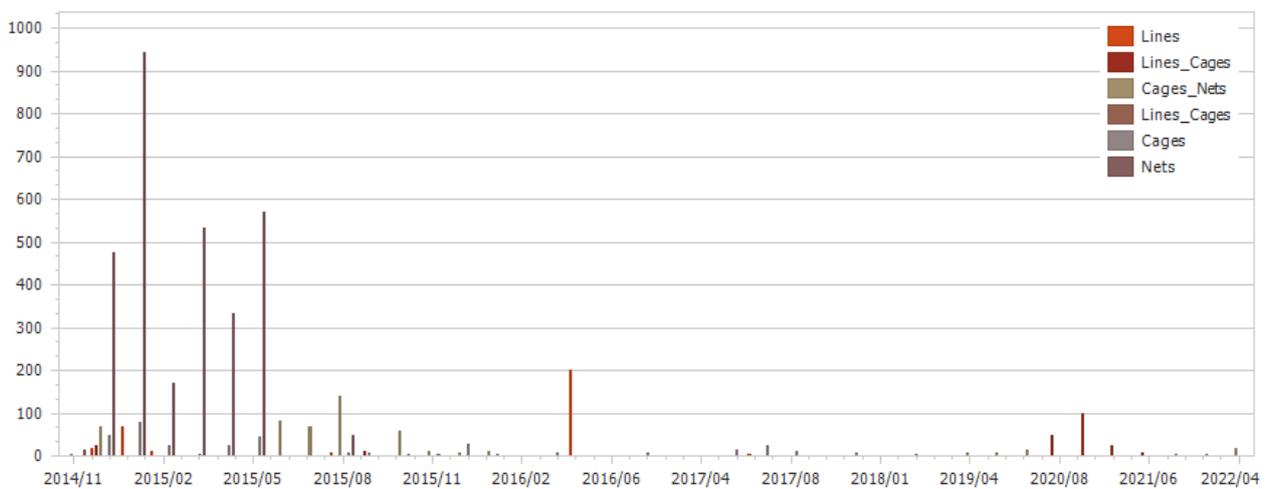
- “Fisheries Total Catch by Year/Month/Day (Kg)” -> Correction of erroneous queries and wrong data for proper data visualization, both in terms of charts and maps.
  - "Qry\_Fisheries\_Catch\_JREDS\_Trasp\_Total\_Catch" is a view that is based on another view ("Qry\_Fisheries\_Catch\_JREDS\_Trasp"), which in turn is derived from the base table "dbo.Catch\_efforts." The query would aim to provide the total catch by weight for each day and fishing zone. The issue is that each day has multiple values for each fishing zone based on the type of gear used (e.g., on day x, there are two rows for "ACT," one for the total catch with nets, and one for the total catch with cages). Because of this, the total catch needs to be grouped both by date and location to have the cumulative catch in Kg. This task hasn't been performed, and the charts on PROGÉS-ISP did not consider the aggregated total in Kg but only the total in Kg for a specific type of gear used (e.g., in that day x, for “ACT” the system picked just the total Kg for cages for charts and maps).
  - To address this issue, the query was completely rewritten ([Annexes: Query02](#)) with grouping both by location and date. The old query was deleted, and the new query assumed the name of the old one.
  - The indicator within PROGÉS-ISP was reloaded and connected to the updated query, keeping the same name. As a result, the charts and map were reconfigured from scratch, and they were showing totally different data from before.
- “Fisheries Total Catch by Year/Month/Day (Kg)” → Reordering of chronological YYYY/MM/DD display.
  - In the data key of the charts of the two indicators, the YYYY/MM/DD were not shown in chronological order, causing confusion and lack of clarity when reading the charts. The problem has been corrected within the “Qry\_Fisheries\_Catch\_JREDS\_Trasp\_Total\_Catch” new view (the extract of Query02 where the problem was addressed is visible on [Annexes: Query03](#)).

2017/07/12	2014/12/02
2019/11/13	2014/12/03
2019/08/22	2014/12/04
2021/08/01	2014/12/06
2019/03/26	2014/12/07
2016/07/03	2014/12/08
2017/07/03	2014/12/09
2019/10/13	2014/12/10
2015/05/03	2014/12/11
2015/02/19	2014/12/13
2015/12/12	2014/12/14
2015/12/15	2014/12/15
2021/09/19	2014/12/16
2022/04/17	2014/12/17
2015/04/23	2014/12/18
2016/02/21	2014/12/20
2016/04/28	2014/12/21
2020/10/07	2014/12/22
2016/05/04	2014/12/23

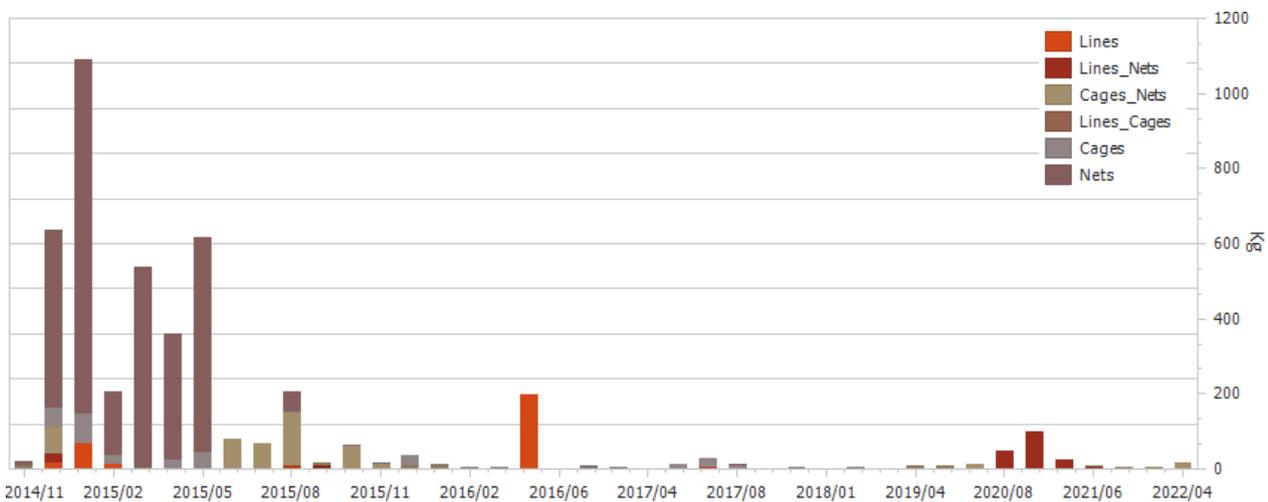
*Data key chronological order confrontation: before and after the query02.*

- Moreover, for the days of 2021 and 2022, the numbers between 0 and 9 do not have a 0 in front. A query ([Annexes: Query04](#)) has performed to update the table and the related views.
- “Fisheries Catch KG/Gear” → Indicator name changed to “Fisheries Total Catch by Typology of Gear (Kg)”
    - The decision was made to standardize the indicator name with the other indicators’ names in the same component.

- “Fisheries Total Catch by Typology of Gear (Kg)” → Adjustments to data series values, chart series, chart visualisation and legend.
  - Added the axis name (Kg), which was missing.
  - Data Series name “Lines\_Cages” was repeated twice, so a wrong legend was set with two identical values. The wrong “Lines\_Cages” was corrected into “Lines\_Nets”, according to the related table’s column name.
  - For all the data series of the indicator, chart series “Stacked Bar” was selected instead of the previous “Bar”. In this way, the charts were significantly improved in both the spatial key and the time key visualisation.



*Before: chart visualisation for Fisheries Total Catch by Typology of Gear (Kg)*

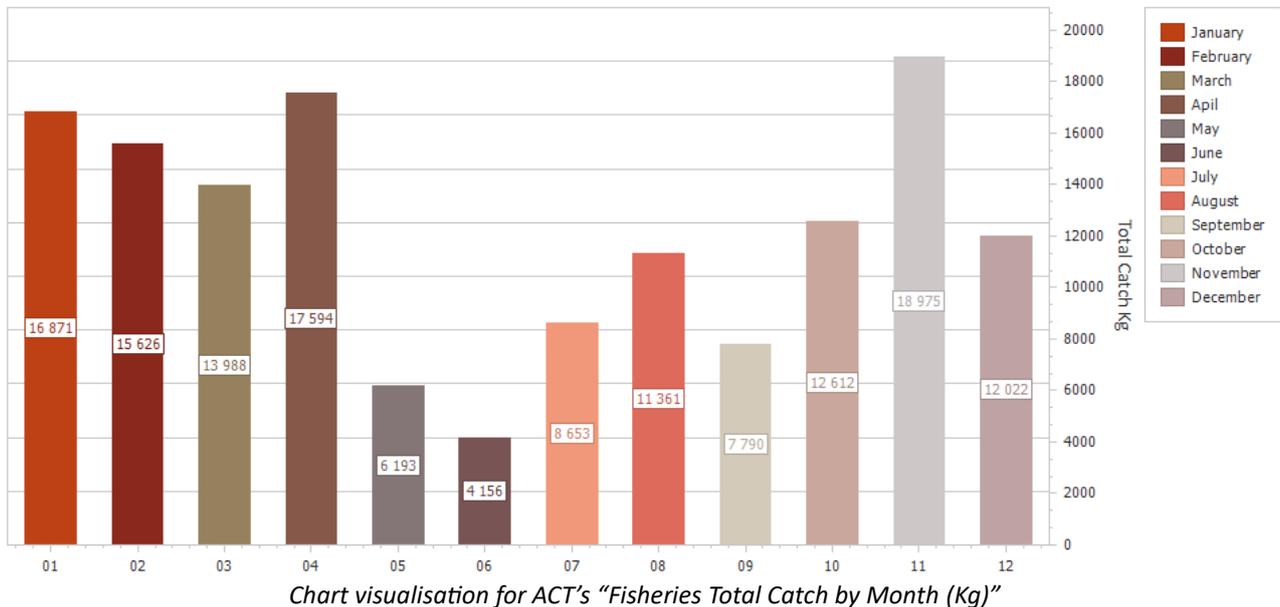


*After: chart visualisation for Fisheries Total Catch by Typology of Gear (Kg)*

- “Fisheries Total Catch by Month (Kg)” → creation of new indicator.
  - The choice was made in order to have all the possible aggregation levels for fisheries catch, since YYYY/MM, YYYY/MM/DD already exist, and YYYY will be simultaneously created.
  - Instead of having just one value, “total weight”, as a legend, it was decided to include all twelve months in order to achieve a more detailed, representative, and enhanced

visualization of data with charts. This was possible by creating a new view ([Annexes: Query05](#)) in the Db.

- The indicator was set up in PROGES-ISP, along with the Spatial Scales, Time Scale, retrieval of data from the new Db view, Data Series, Charts series and Label Pattern.



- “Fisheries Total Catch by Year (Kg)” → creation of new indicator.
  - The choice was made in order to have all the possible aggregation levels for Fisheries Catch, since YYYY/MM, YYYY/MM/DD already exist, and MM will be simultaneously created.
  - As first step, a view ([Annexes: Query06](#)) was created within the Db, starting from the table “dbo.Fisheries\_Catch\_JREDS”.
  - The indicator was set up in PROGES-ISP, along with the Spatial Scales, Time Scale, retrieval of data from the new Db view, Data Series, Charts series and Label Pattern.
  - Charts and Maps visualisation was set up according also to the other indicators present in the same subcomponents.

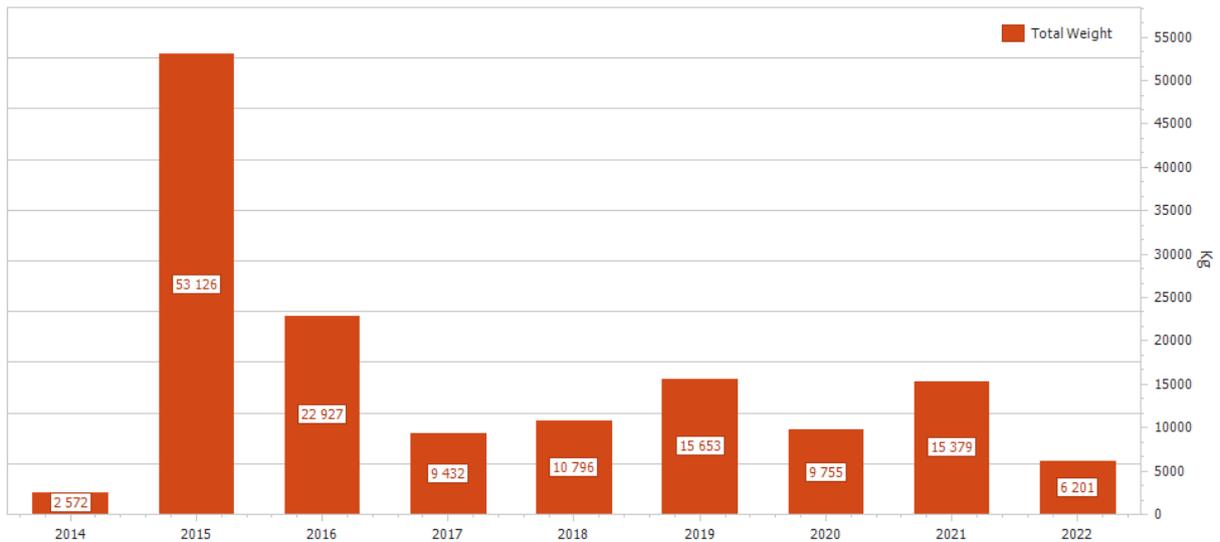
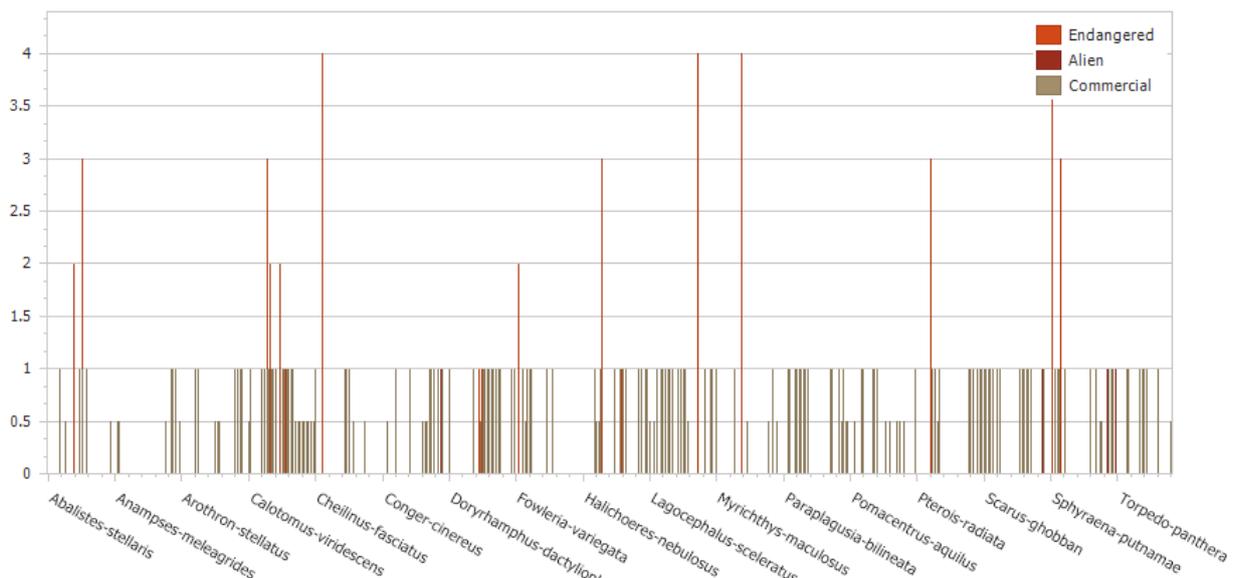


Chart visualisation for ACT's "Fisheries Total Catch by Year (Kg)"

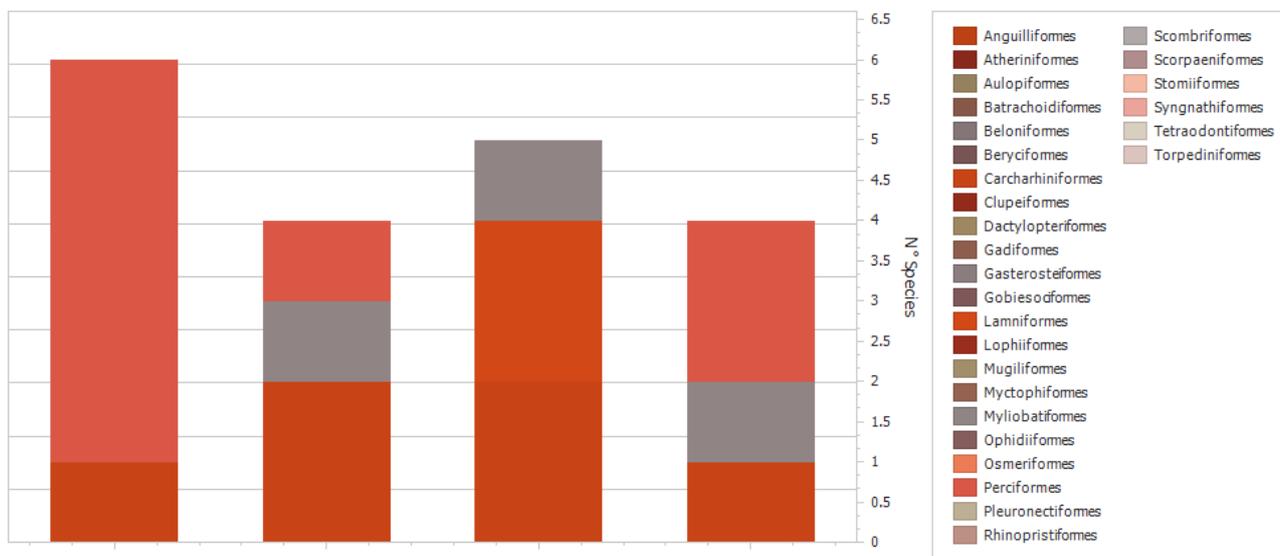
### Fish (Id=33)

- "Presence of species" → indicator division, errors correction, data integration at Db and PROGES-ISP level.
  - It is an indicator that categorizes the fish species of a checklist. The graph visualization is not clear and confused, and the legend is unclear as well. The categories included in the same indicator are:
    - ❖ Alien status (values 0 and 1)
    - ❖ Endangered status (values from 0 to 4)
    - ❖ Commercial Status (values 0, 0.5, 1)
  - It is suggested to divide the indicator in three different indicators: one for the endangered status, one for the alien status, one for the commercial status.



Before: chart visualisation for endangered, Alien, Commercial Species.

- “Endangered Status by Order as Total Number of Species” → creation of new indicator as a part of “Presence of Species” division.
  - The initial choice was to work not with individual species but with a higher level of taxonomic hierarchy, the Order. This decision was made because there is a large number of species, which could make the chart confusing, and unreadable and visible in the image.
  - A detailed search, species by species, was conducted to gather information on their respective Order.
  - A query was performed in the Db ([Annexes: Query07](#)) in order to update the target table, “dbo.Fish\_checklist”, with a new column with the Order, which was previously missing.
  - A new view, “Qry\_FishChecklist\_EndangeredAggregatedOrder”, was created within the Db starting from the updated target table “dbo.Fish\_checklist”. The view is presented in ([Annexes: Query08](#)) and it was needed to present data grouped by Order.
  - Data type of “Endangered” column in the Db table “dbo.Fish\_checklist” was changed to “nchar(1)” not to have float values in the X axis for the chart visualisation.
  - The new indicator was set up in PROGES-ISP, along with the Spatial Scales, Time Scale, retrieval of data from the new Db view, Data Series, Charts series and Label Pattern.



*After: chart visualisation for Endangered Status by Order as a sum of Species.*

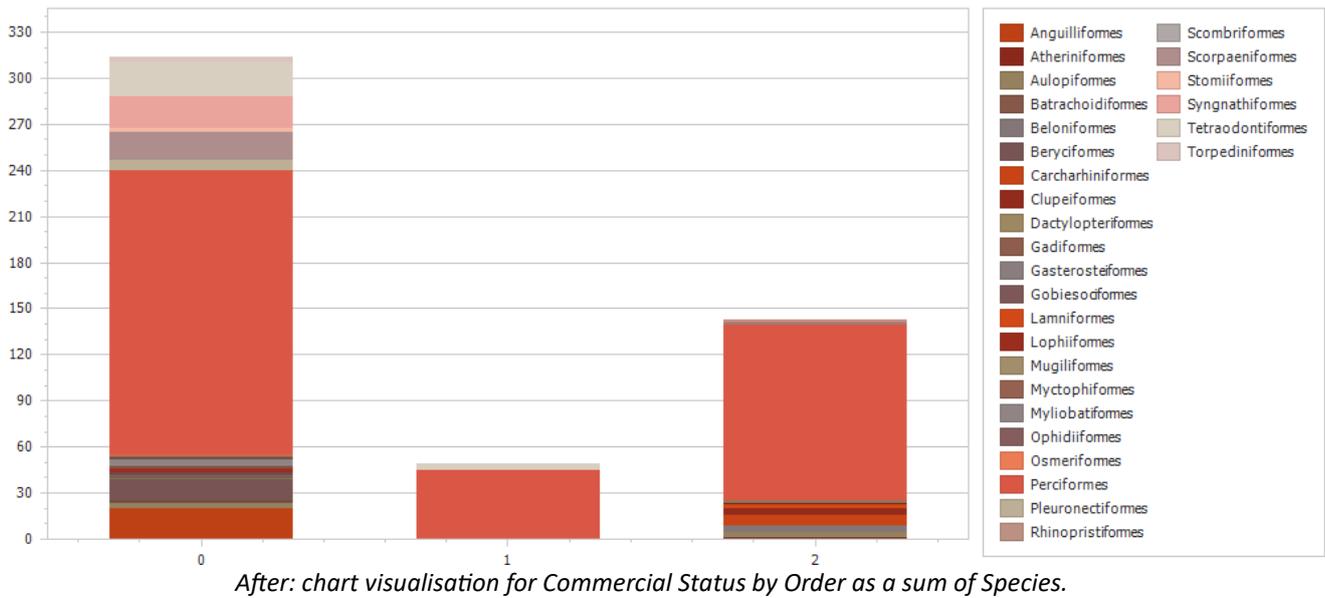
- “Alien Status by Order as Total Number of Species” → creation of new indicator as a part of “Presence of Species” division.
  - The initial choice was to work not with individual species but with a higher level of taxonomic hierarchy, the Order. This decision was made because there is a large number of species, which could make the chart confusing, and unreadable and visible in the image.

- A new view, “Qry\_FishChecklist\_AlienAggregatedOrder”, was created within the Db starting from the updated target table “dbo.Fish\_checklist”. The view is presented in ([Annexes: Query09](#)) and it was needed to present data grouped by Order.
- Data type of “Commercial” column in the Db table “dbo.Fish\_checklist” was changed to “nchar(1)” not to have float values in the X axis for the chart visualisation.
- The new indicator was set up in PROGES-ISP, along with the Spatial Scales, Time Scale, retrieval of data from the new Db view, Data Series, Charts series and Label Pattern.



*After: chart visualisation for Alien Status by Order as a sum of Species.*

- “Commercial Status by Order as Total Number of Species” → creation of new indicator as a part of “Presence of Species” division.
  - The initial choice was to work not with individual species but with a higher level of taxonomic hierarchy, the Order. This decision was made because there is a large number of species, which could make the chart confusing, and unreadable and visible in the image.
  - First of all, a query ([Annexes: Query10](#)) was performed to update the Db target table “dbo.Fish\_checklist” in order to change the values from 0, 0.5, 1 to 0, 1, 2.
  - A new view, “Qry\_FishChecklist\_CommercialAggregatedOrder”, was created within the Db starting from the updated target table “dbo.Fish\_checklist”. The view is presented in ([Annexes: Query11](#)) and it was needed to present data grouped by Order.
  - Data type of “Alien” column in the Db table “dbo.Fish\_checklist” was changed to “nchar(1)” not to have float values in the X axis for the chart visualisation.
  - The new indicator was set up in PROGES-ISP, along with the Spatial Scales, Time Scale, retrieval of data from the new Db view, Data Series, Charts series and Label Pattern.



- **Fish and Occupational Fishing** → Setting up of new indicator.
  - During the meetings with the local Jordanian team, the possibility of creating a cross-view between two different Db tables, “dbo.Fish\_checklist” and “dbo.Fisheries\_Catch\_JREDS”, was discussed. The first table contains the level of endangerment according to the IUCN classification, with values ranging from 0 to 4, while the second contains the catch values. The idea was to see which threatened species were caught, how many kilograms of these species were caught, where they were caught, and also during which periods of the year.
  - To achieve this, considering the two tables, the values in the two columns containing species names must match perfectly. A preliminary refinement and correction of errors and misspellings have been carried out at the Db level on the selected columns, with the idea of using the English names of the species to create the view. Currently, the names in the “dbo.Fish\_checklist” are still too generic, and there is no correspondence, except for a few cases, with the names in the other table’s column.
  - The query has already been prepared for the moment in which the names will be provided correctly ([Annexes: Query12](#)).

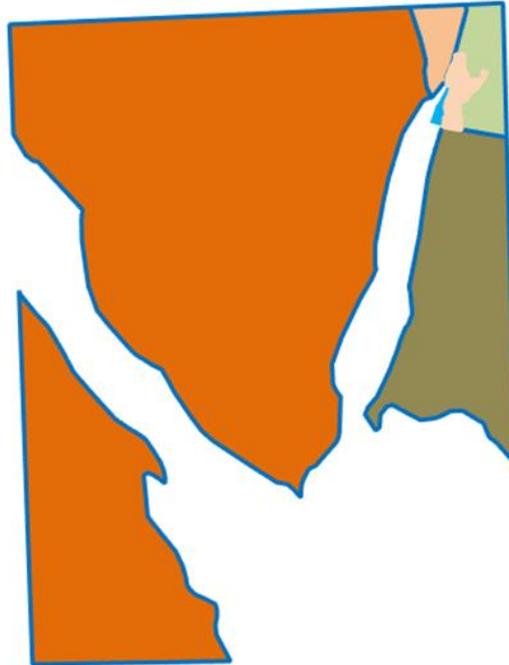
## Diving Centre

- N° of Divers (Users) → Adjustments to the indicator at DB level.
  - In the Db table “dbo.Diving\_Record\_2014”, and so in the related view “Dive\_Center\_Visitors\_2014” from which this indicator retrieves the data, the months from 1 to 9 are written without a leading 0, causing a disorderly and non-chronological display of the date key. The problem was fix with an update query ([Annexes: Query13](#)).
  - The data types of the “Month” and “Year” columns were incorrect and have been corrected to nchar(2) and nchar(4).
  - The view “DiveSites\_Visitors\_2014\_Date”, which is derived from the table “dbo.Diving\_Record\_2014”, and from which the view “Dive\_Center\_Visitors\_2014” is

derived (tableA -> viewB -> viewC), has been rewritten ([Annexes: Query14](#)) to order the data key visualisation in PROGÉS-ISP by YYYY/MM. The new view has taken the name of the old view to maintain the relationships between indicators in PROGÉS-ISP and the database.

#### 4.1.2 GIS Base and Reference Maps Enhancement

##### 4.1.2.1 Default Map



*Before: ISP-PROGES GIS default view.*

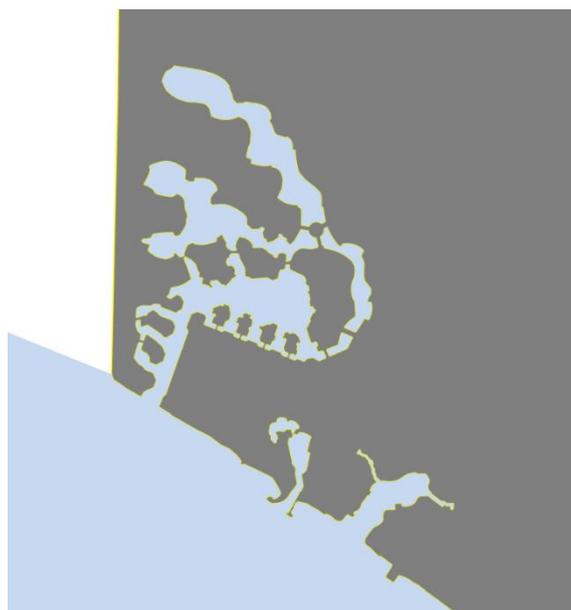
The default map of the Jordanian system, when opened in PROGÉS-ISP, presented several issues both in terms of effective graphical representation and geometrical consistency (overlaps and gaps in the digitalisation of different layers). A complete rework was carried out using QGIS with the following steps:

- Download of World Map by Countries.
- Download of World Map by Sea regions.
- Importing ASEZA boundaries.
- Selection and exporting of Countries of interest.
- Selection of Sea Regions of interest.
- Selection and exporting of Jordan (which will have a different colour).
- Selection and exporting of Sea regions of interest.
- Set and exporting of GIS vector with new and correct CRS.
- Digitalisation to make the layers consistent with each other (no overlap, holes).
- Creation of others Project Partners GIS vector.
- Importing of GIS vectors within PROGÉS-ISP Data Management Toolbox.
- Setting of legend and visualisation hierarchy for all the GIS vectors.
- Remove of old GIS vectors.



*After: ISP-PROGES GIS default view.*

The new map provides a view of the entire Mediterranean area, where three other project partners in MED4EBM (natural reserves in Italy, Tunisia, and Lebanon) are marked with red points. To represent Jordan, a grey colour has been chosen to highlight it from the other Countries, which are in white colour. When zooming in on Jordan, the area of interest identified in Aqaba Special Economic Zone Authority (ASEZA) can be noticed with a darker grey colour and a yellow border that makes it more visible and make it stands out from the rest. The quality of the digitisation and match between the different layers can be seen even for the most complex areas, such Ayla. No gaps or overlaps are present between the sea, ASEZA, Jordan Country, and the other Countries.



*After: ISP-PROGES GIS default view – Ayla.*

Another crucial aspect of the default visualization of the Jordanian project area was the absence of a GIS vector for the Aqaba Marine Reserve. As demonstrated, a significant portion of the data collected for the implementation and population of indicators within PROGES-ISP refers to other spatial references such as fishing zones, monitoring points, and diving sites, with no specific data available for the protected area. Nevertheless, having the territorial boundaries of the protected area in considered essential for the completeness of the GIS default visualization and because in the future, detailed data may be collected and associate with the vector of the protected area. To address this improvement, during the mission in Rome, Italy (see more in "Technical Mentoring: Training By Doing and Events"), a digitization process was undertaken for the protected area using an external software, QGIS, following these steps:

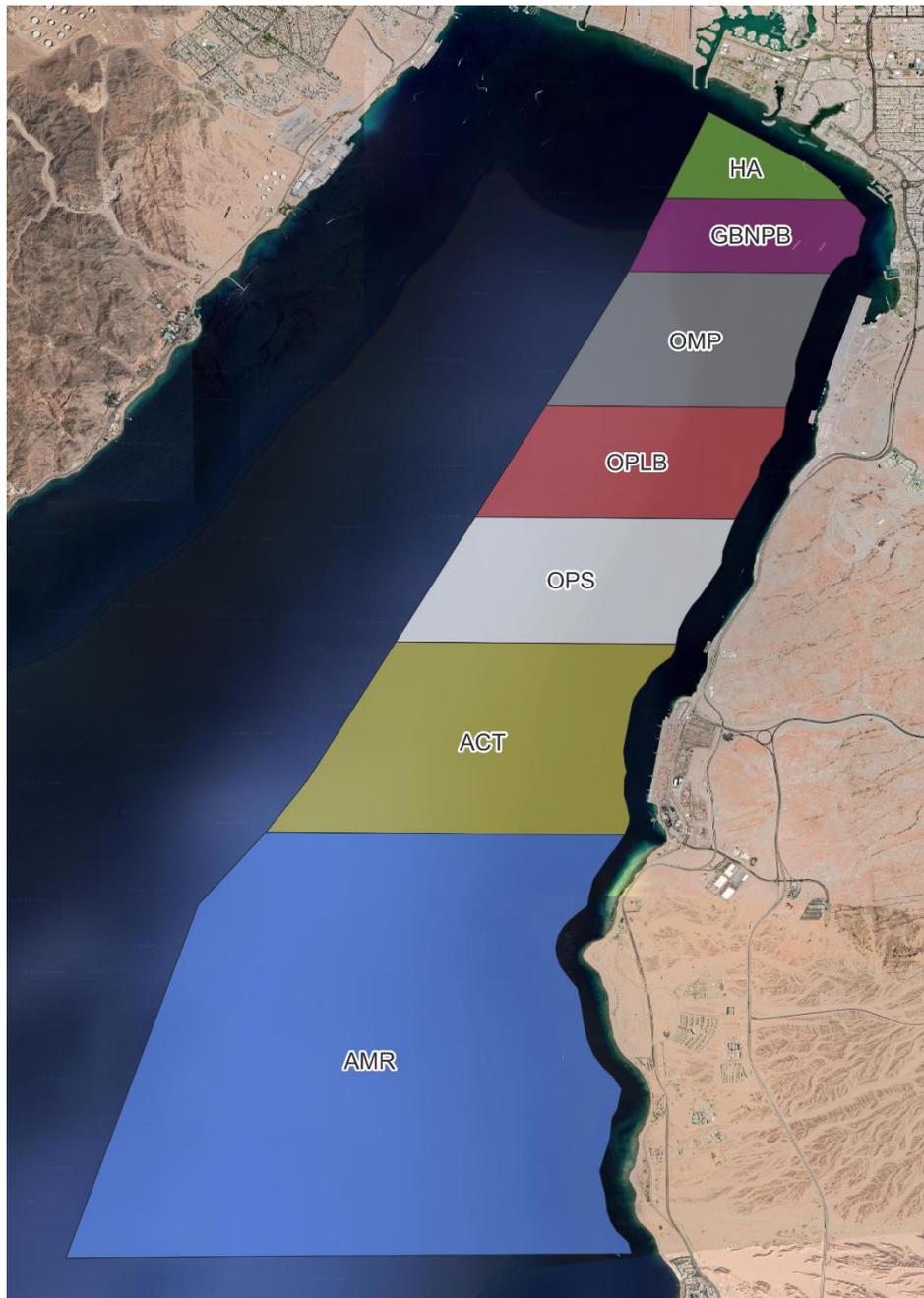
- Creation of the shapefile "Aqaba Marine Reserve's Zoning Plan"
- Importing of the geometries from the shapefile "General Use".
- Merging the buffer areas from the shapefile "Main Areas".
- Importing of the merged buffer from the shapefile "Main Areas".
- Upload of the shapefile into PROGES-ISP with the DMT's tool "Shapefile to ISP-FTP as base maps"
- Set up the legend for the visualisation of the shapefile in the default map.



*After: ISP-PROGES GIS default view – Aqaba Marine Reserve and Buffer Zones.*

#### 4.1.2.2 GIS Maps

A first attempt at the new digitization of the fishing zones was carried out considering the significance of the GIS vector for future data visualization within the framework of the new EBM protocol for fisheries in the Gulf of Areas. In fact, such data collection procedure needs a consistent geographic foundation to be used on both on PROGES-ISP, but also during on-the-field operations. Generally, having an official geographic base is essential for accurate data representation, analysis, and decision-making processes in the project and the presented steps aim, in first instance, to correct overlapping errors and gaps left between the various areas in the GIS vector. Additionally, the horizontal sides of the various areas, which were not parallel before, have been corrected and made parallel using advanced digitization tools within QGIS.



*Fishing Zones GIS vector refined.*

Moreover, a general consideration is made regarding the accuracy of the positioning of the fishing areas in the GIS vector. It is necessary to understand the reasoning behind the choice of these individual fishing zones that compose the GIS vector, their digitization, subdivision, and naming. Subsequent meetings with the local Jordanian team have been organized to further refine this version, with a special attention to the buffer zone

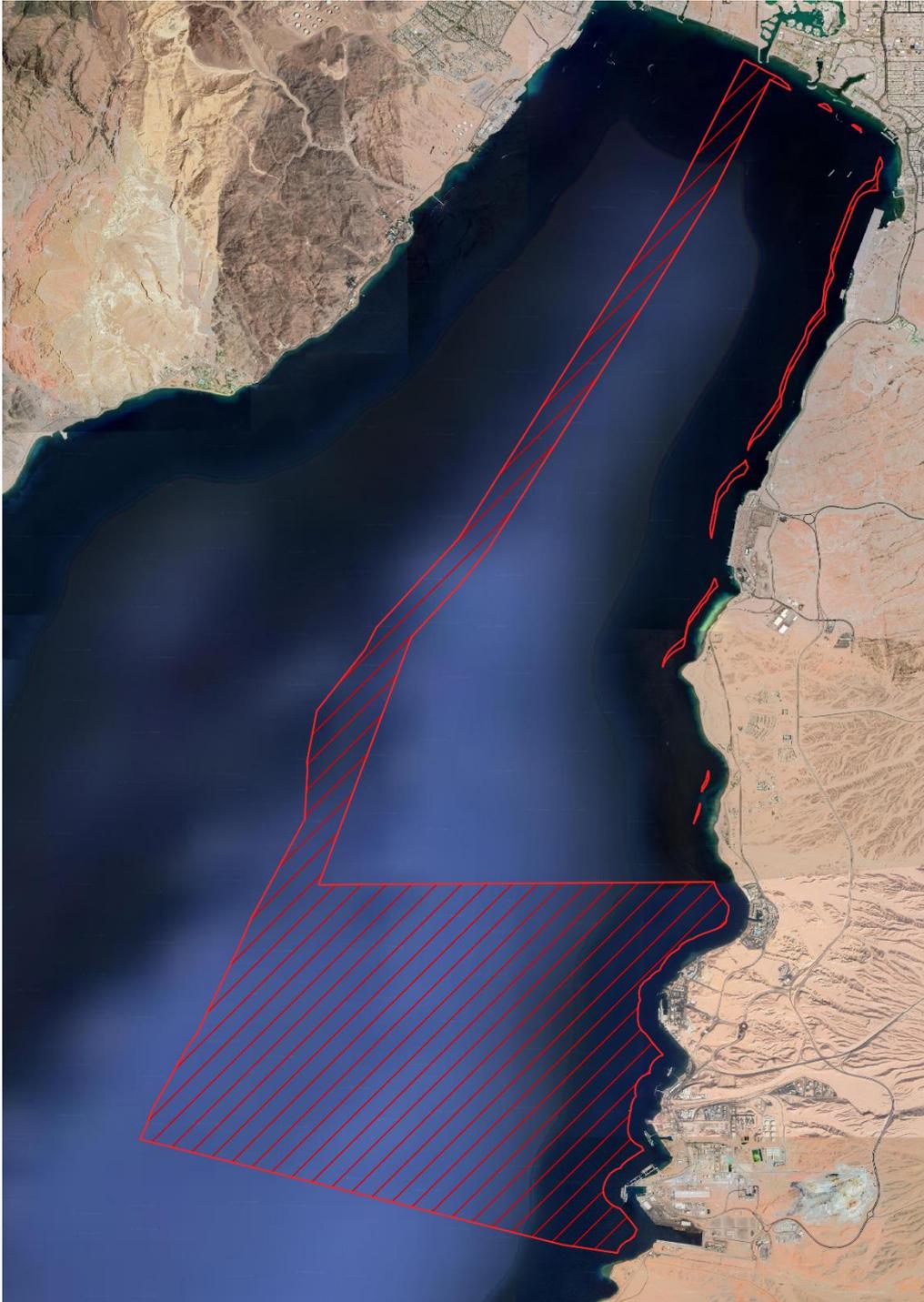
from the coast, which is supposed to be set at a default value of 300 meters to avoid errors in the mapping of fishing areas. In the old version of the GIS vector, distances ranging from 200 to 400 meters separate the coast from the fishing areas. For this purpose, a map was developed using QGIS depicting the areas of the GIS vector that fall within the 300-meter buffer from the coast, where fishing is prohibited. In addition, outside the 300 meters buffer zone along the coast where fishing is expressly prohibited, the fishing areas does not fully encompass Jordanian territorial seas. In order to determine the part of the sea left out of the digitalisation of fishing zones but where fishing could still be allowed, the following steps have been performed in QGIS:

- a. To obtain a GIS vector that shows the areas where fishing could be allowed but have not been included into the fishing a vector, many steps using the QGIS difference tool need to be performed following this logic:

$$\text{FinalVector} = \text{Territorial Seas} - \text{Fishing Areas} - \text{Buffer Zone}$$

- a. Download of GIS vector of Jordan territorial Seas (<https://marineregions.org/>).
- b. Reprojection of ASEZA GIS vector from EPSG 4326: WGS84 to EPSG 32636: WGS 84 / UTM zone 36N. This step was necessary because a buffer will be created, and the buffer tool in QGIS allows you to set the buffer distance in meters only if the Coordinate Reference System (CRS) is projected (cartographic coordinates) and not geographic.
- c. A buffer of 300 meters was created to establish the coastal no-fishing zone starting from the coastline of the ASEZA boundaries.
- d. The difference tool was used for territorial seas GIS vector on the Buffered ASEZA vector to exclude those areas where fishing is prohibited anyway.
- e. The difference tool was used again for the resulting GIS vector, this time on the fishing area GIS vector, to exclude those areas where fishing is already permitted.

As a result, a GIS vector was exported with the territorial extent of the Jordanian seas outside the fishing zones and the 300-meter coastal buffer. This exported GIS vector highlight the areas where the fishing activities could still be allowed.



*Areas of Jordanian territorial seas not included in fishing zones and outside 300 meters buffer from coast.*

This work required a further step to address this problem and to identify how to change the GIS vector of the fishing zones to better mirror the Jordanian legislative framework. For this reason, during the mission held in Rome, new GIS vectors were provided by the Jordanian technical team with the official areas where fishing is prohibited or allowed in the Gulf of Aqaba. With the new GIS vectors, a comparison with the previously discussed GIS vector was possible. From the analysis work conducted using the "intersect" function between the two GIS vectors, it emerged that a significant portion of the area within the fishing zone "AMR" is not available for fishing. Meanwhile, a small section of the "ACT" area falls within a zone where fishing is actually prohibited.



*Areas of old Fishing Areas vector intersected with the new, official Fishing Areas Vector.*

The subsequent step in the analysis work conducted within QGIS was to identify areas in the new, official fishing zone GIS vector where fishing is permitted but were not taken into account in the old GIS vector. The analysis, performed with the “difference” function within QGIS, revealed a strip bordering the west, north, and east of the old vector where fishing activities are still allowed.



*Areas where fishing activities are available but not considered in the old GIS vector.*

These modifications were incorporated into a third, new GIS vector where fishing activities are available, excluding any areas where fishing is not available or prohibited. The new GIS vector geometry was then divided into fishing areas according to the GIS old vector. This new vector employs an improved digitization process, addressing issues such as duplicate vertices and gaps between geometries. Moreover, it accurately reflects the actual area where fishing is permitted and respects the no-fishing zones near the coast. The vector will be discussed with the local team and will replace the old vector within PROGES-ISP. This update will result in a more precise, accurate, and enhanced visualization of fishing-related data, serving as a suitable base map for data coming from the EBM Fisheries protocol.



*New GIS vector with the fishing areas according to the old GIS vector.*

Furthermore, during the review phase of the Jordanian project conducted during the in-person mission in Aqaba, it was noticed that numerous acronyms were chosen for the base and reference GIS maps used to visualize data within the PROGES-ISP. Many of these acronyms were unfamiliar even to the members of the local team themselves, so efforts were made to clarify these acronyms. In order to keep track of this work and to facilitate the understanding of these acronyms in the future, both for technical team members and stakeholders who will be using the system, a written legend with all the acronyms and their explanations was created ([Attachment 1](#)). This legend has also been uploaded to the Data Management Toolbox under the "shapefile" section, so it can be downloaded as needed by anyone who requires it.

## 4.2 PP5: TCNR, Lebanon

### 4.2.1 DB and PROGES-ISP Enhancement

The work carried out for the technical implementation of the Tyre Coast Natural Reserve started before the modification or loading of indicators into the PROGES-ISP software. The components of the Lebanese system diagram, and consequently the database, were mostly empty of any data, with few exceptions as shown in the “Technical report on the project’s implementation progress”, which is the second deliverable of the consultancy.

Given the environmental challenges arising from the conservation of a natural coastal area such as Tyre Coast Natural Reserve, the main focus has been placed mainly, but not only, on marine surveys. The second condition that determined this choice was the factor of time, as it was not possible to fully implement a system that at the end of the project is still empty and lacks data collected from stakeholders and local institutions. Moreover, the need to complete the system cause-effect analysis document and to develop management protocols arose. For this reason, on one hand, the key themes identified for the implementation of EBM approach needed to be addressed and, on the other hand, the analysis needed to rely on the outputs of the PROGES-ISP software.

The data gathering process work was carried out mainly on a series of three different marine surveys that took place at different times in the stretch of sea in front of the city of Tyre. The data was collected and organized by the reports that analysed these three different missions:

- [Marine Survey in 2013](#): RAC/SPA - UNEP/MAP, 2014. Ecological characterization of sites of interest for conservation in Lebanon: Enfeh Peninsula, Ras Chekaa cliffs, Raoucheh, Saïda, Tyre and Nakoura. By Ramos-Esplá A.A., Bitar G., Khalaf G., El Shaer H., Forcada A., Limam A., Ocaña O., Sghaier Y.R. & Valle C. Ed. RAC/SPA - MedMPAnet Project, Tunis: 146 p + annexes.
- [Marine Survey in 2017](#): IUCN, THE SUSTAINABLE FISHERIES MANAGEMENT FOR IMPROVED LIVELIHOODS OF THE COASTAL FISHING COMMUNITY IN TYRE, SOUTH LEBANON (2017).
- [Marine survey in 2020](#): SPA/RAC–UN Environment/MAP, 2020. Ecological characterization of the coastal and marine habitats in Tyre, Lebanon. By Abou Arrage J., Azzi N., Ed SPA/RAC. IMAP-MPA Project, Tunis: 71 pages + annexes.

All the tables that were prepared, both the source tables and the partitioned tables ready for direct loading into the database, have been shared with the local team. The team has been trained on Db and PROGES-ISP and it is expected to load the tables within the system. Along with these tables, all the GIS vectors have been provided to serve as base maps for setting up and visualizing maps within the software. Other data was gathered and uploaded into the system concerning the socio-economic and the marine reptile components of the system diagram.

#### 4.2.1.1 *Marine Survey in 2013*

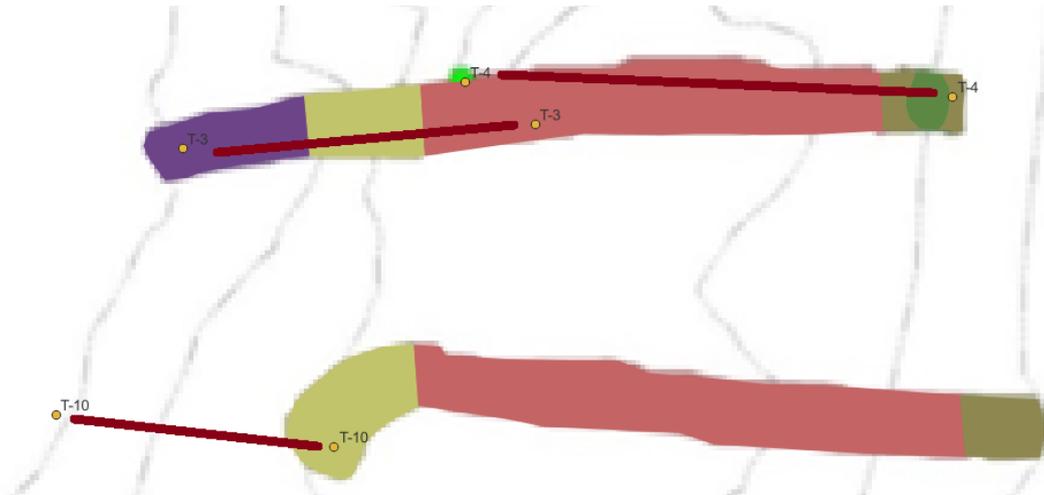
The data related to the marine survey in 2013 were collected from the report "RAC/SPA - UNEP/MAP, 2014. Ecological characterization of sites of interest for conservation in Lebanon." The report presents data on two different topics, concerning both species abundance and habitat type. In this report data for "Relative Abundance" are proposed with the following classification:

- 3 very common
- 2 common
- 1 less common

Once the tables relating to the survey carried out in Tyre were identified, the data collection and systematisation in Excel sheets was carried out as explained below.

- 1) In the annexes of the report, two different tables for Tyre were presented. They were divided by the observation methodology adopted. Here's the information:
  - Table 1 (Hydroplane): There are 9 stations with all the species observed and their relative abundance values of 1, 2, and 3.
  - Table 2 (Scuba Dives): There are 25 stations with all the species observed and their relative abundance values of 1, 2, and 3.
- 2) For the purpose of loading data into the database and then into PROGES-ISP it is preferable to work with a single table, especially if the data is on a single topic like in this case. For this reason, the two tables, after being manually transcribed into an Excel spreadsheet, were merged.
- 3) A column to both tables to preserve the information about the observation methodology was added with the name "TypeObs". Knowing that some species were recorded at various stations using both methods, a third possible value to the column was added resulting in the following classification:
  - 1 Hydroplane
  - 2 Scuba Diving
  - 3 Hydroplane and Scuba Diving
- 4) Many species names were repeated because they came from two different tables. For this reason, and to have unique species names, they were merged in such a way that there would be a single row with all the relative abundance values related to the survey stations.
- 5) All species names were cleaned, as they contained information about the species cataloguer and the year of publication.
- 6) The names also included an asterisk if the species was non-indigenous. A new column called "Status" in the merged table was created with the following values in order not to lose the information.
  - 1 Native Mediterranean species
  - 2 Non-Indigenous Species

- 7) In the two tables, the categorization of species is not always consistent. Sometimes species are categorized by Phylum, sometimes by Class, and sometimes by Kingdom, without a clear distinction and with some mistakes as well. For this reason, systematic work has been done to add the following columns and values in addition to the species column:
- Kingdom
  - Phylum
  - Class
  - Order
  - Family
  - Genus
- 8) At this point, the source table with relative abundance data for species has been created. For loading it into the database and PROGÉS-ISP, the expected Excel sheet format includes a column for the spatial key and a column for the time key, with as many columns as there are parameters to monitor. However, currently, the taxonomic classification occupies the rows when it should actually occupy the column headers. Conversely, the survey stations are now column headers when they should be included in a single spatial key column. Therefore, transpositions are necessary before inserting the data into the software. Transpositions were performed in order to get the following tables:
- Kingdoms: Abundance and Richness sheets.
  - Phylum: Abundance and Richness sheets.
  - Class Abundance and Richness sheets.
  - Order Abundance and Richness sheets.
  - Family Abundance and Richness sheets.
  - Genus Abundance and Richness sheets.
- 9) The methodology used for aggregating multiple rows had to take into account an important technical issue. Indeed, aggregating at different levels (e.g., many species into one class) would mean that each station (column) would have several species (rows) with several abundance values of 1, 2, 3 given by the various species. All these rows had to be aggregated and to be reconducted to a single row (the class).
- For relative abundance the maximum value was chosen. The MAX function in Excel was used to retrieve this information.
  - For the species richness the distinct number of species aggregated for each station was calculated using the COUNT function in excel.
- 10) In order to upload the data into the PROGÉS-ISP, a GIS reference vector must be created as well. Starting from the survey station coordinates given by the report, a total of 34 point was digitalized. There remains an issue with the quality of the presented GIS vectors: the points are sometimes provided with a double set of coordinates, meaning that they are transects. However, once digitized, they do not correspond to the transect map provided in the report, which also contains information about the habitat. This issue should be resolved by the local Lebanese team.



*Misalignment of digitized points and transects.*

#### 4.2.1.2 Marine Survey in 2017

The data related to the marine survey in 2017 were collected from the report "IUCN, THE SUSTAINABLE FISHERIES MANAGEMENT FOR IMPROVED LIVELIHOODS OF THE COASTAL FISHING COMMUNITY IN TYRE, SOUTH LEBANON (2017)." The workflow for retrieving data from this report is explained as follows:

1. The 39 survey points, divided into 8 different areas (Bakbouk, Bayada, East Zire, Jamal, Jamal deep, Qasmieh Springs, Zire, Turtle reef), were digitized in QGIS. The resulting vector was named as "S.Sites". Additionally, an Excel table was created with information about coordinates, depth, and substrate type for the 39 survey points.
2. Apart from the information provided, in the report there is no data related to the individual 39 sampling points. The main data reported in the document rather refer to another spatial key, the 8 different survey areas. Since it is still necessary to have a GIS vector as spatial reference to append the data in PROGÉS-ISP, the following approach has been used. The QGIS tool "Mean Coordinates" was performed so that the points were merged into one geometry based on their location. The new shapefile was named "S.SitesMean".
3. At this point and the data transcription process in Excel could begin, resulting in the creation of the following tables, all related to the "S.SitesMean" GIS vector:
  - Percentage cover of seaweed species estimation.
  - Species Richness, Abundance, Biomass, Value.
  - Biomass Mean abundance per species.
  - Biomass Mean biomass per species.
4. The report also includes a table with all the species that have been identified during the survey. This table does not refer to "S.Sites" or "S.SitesMean" but is a summary of the whole survey conducted in 2017. For this reason, all the different points were merged into one geometry and a new, third vector representing the entire area was created, called "TotalPoints." The following tables were then created

in Excel after collecting and refining the data (in terms of creating numerical categories, adding taxonomic classification columns) :

- Fish Species assemblages Spatial Category
- Fish Species assemblages Native Status
- Fish Species assemblages Trophic Category
- Fish Species assemblages Total Abundance
- Fish Families assemblages Total Species
- Fish Families assemblages Total Abundance
- Fish Families assemblages Mean Comm Value
- Fish Status assemblages Abundance

#### 4.2.1.3 *Marine Survey in 2020*

The third document analysed, “SPA/RAC–UN Environment/MAP, 2020. Ecological characterization of the coastal and marine habitats in Tyre, Lebanon. By Abou Arrage J., Azzi N., Ed SPA/RAC. IMAP-MPA Project, Tunis: 71 pages + annexes”, is intended to provide a concise ecological characterization of the coastal and marine environment of the Tyre Coast Natural Reserve (TCNR). Its primary objective is to identify species and habitats that hold potential conservation value and to formulate effective management strategies. Its purpose is to consolidate findings from the two previously analysed studies conducted in the TCNR. Moreover, it incorporates a more recent assessment of specific habitats within the protected area.

For the 16 survey points of the latest report, a new GIS vector was created as well as an Excel sheet with their related coordinates and substrate types.

#### 4.2.1.4 *Tyre City Profile in 2017*

In addition to the work on marine surveys, another official report was used to gather contextual data about the city of Tyre. The data were manually entered into Excel sheets and then formatted in such a way as to make the tables ready for loading into the database and then into PROGES-ISP. The report is titled "UN-Habitat. Tyre City Profile (2017)." Data were collected for:

- Four Municipalities of Tyre: Aabbassiyet Sour, Aain Baal, Borj Ech-Chemali, Sour, Tyre District, of which also the GIS vector was retrieved from online repositories. Data were on:
  - Estimated and reconstructed total population for 1997 and 2011, divided into Leb\_PRL\_Outside Camps, Syrian\_Refugees, PRL\_Camps, PRS\_All, and Total Population.
  - Population density calculated for the four Municipalities, computed by using also the QGIS field calculator to determine the area of the four different Municipalities.
- Three Refugee Camps of Tyre: El Buss, Rashidieh, Borj Ech-Chemali:
  - Estimated population for 2011, with the digitalisation of the areas that was performed manually in order to obtain GIS vectors for the refugee camps.

- Urban Area, which is a specific GIS reference used in the report was derived from the four Municipalities and represents the most urbanized part of the Tyre District.
  - Since the area doesn't correspond to any of the official administrative boundary, the GIS vector was obtained by georeferencing and the digitalising the map retrieved from the report.
  - Excel sheet were prepared with data on land use for the 2016, with information on categories such as mixed residential and commercial, cemetery, commercial, cultural, education, harbour, health, industrial, military, parking, playground, touristic.

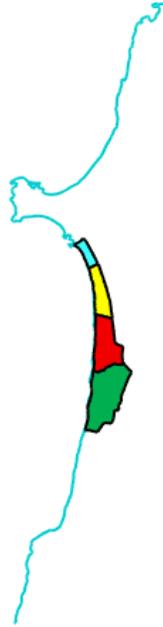
### Marine Reptiles

The process of implementing the system also involved data on two species of sea turtles surveyed between 2020 and 2022: *Caretta caretta* and *Chelonia mydas*. The data were collected in a single table provided by TCNR. Before uploading it into the DB and then into PROGES-ISP, the table underwent a formatting process that made it ready for use. The following operations have been completed:

- a. Loading GIS vector into PROGES-ISP: All of these surveys are related to a set of beaches throughout Lebanon. Therefore, the points were initially imported into QGIS with their coordinates, and only those points falling within the Tyre District were exported. The new GIS vector was then imported into the DMT of PROGES-ISP as a reference map.
- b. The source tables on *Caretta caretta* and *Chelonia mydas* were uploaded into the DMT repository with respective entries under the item Marine Reptiles. In this way, using the tool "Spreadsheet to Db Table", it was possible to fill the tables previously created within the Db.
- c. Creation of indicator *Caretta caretta* (spatial and time key, data series, charts):
  - Number of nests
  - Number of Hatched Eggs
  - Number of Unhatched Eggs
  - Number of Hatched Eggs – Alive
  - Number of Hatched Eggs – Dead
- d. Creation of indicator *Chelonia mydas* (spatial and time key, data series, charts):
  - Number of nests
  - Number of Hatched Eggs

## 4.2.2 GIS Base and Reference Maps Enhancement

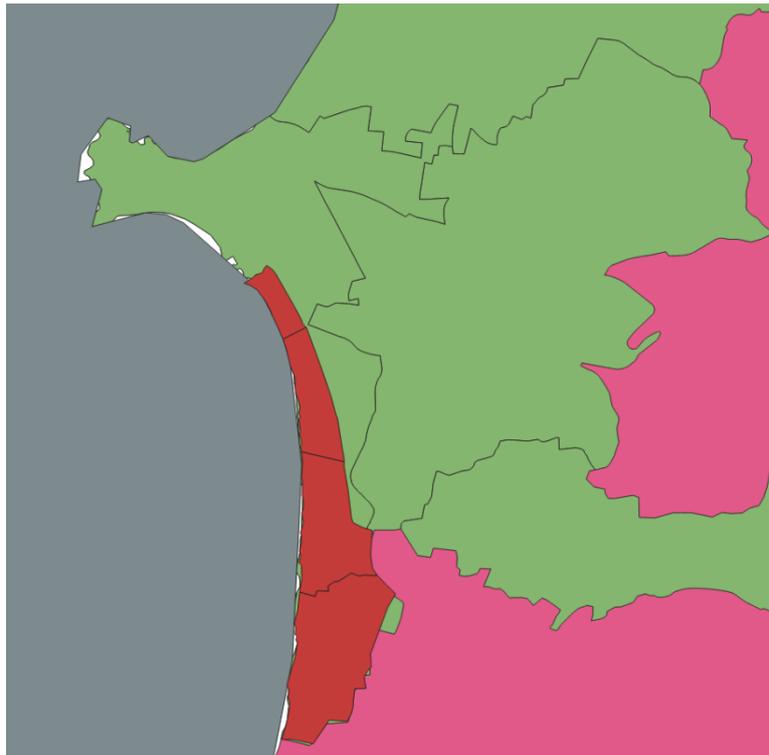
### 4.2.2.1 *Default Map*



*Before: ISP-PROGES GIS default view.*

The default map of the Lebanese system, when opened in PROGES-ISP, exhibited various issues, including challenges in effective graphical representation and geometric consistency, such as overlaps and gaps in the digitization of different layers. To address these issues, a comprehensive reworking process was undertaken using QGIS to create a new default view, involving the following steps:

- Download of World Map by Countries.
- Download of World Map by Sea regions.
- Download of Administrative Boundaries of Lebanon (Municipalities)
- Importing TCNR boundaries.
- Selection of Municipalities of Tyre and merge.
- Selection of Sea Regions of interest.
- Selection and exporting of Lebanon.
- Selection and exporting of Sea regions of interest.
- Set and exporting of GIS vector with new and correct CRS.
- Digitalisation to make the layers consistent with each other (no overlap, holes).
- Creation of others Project Partners GIS vector.
- Importing of GIS vectors within PROGES-ISP Data Management Toolbox.
- Setting of legend and visualisation hierarchy for all the GIS vectors.
- Remove of old GIS vectors.



*QGIS view with new layers digitalisation problems*

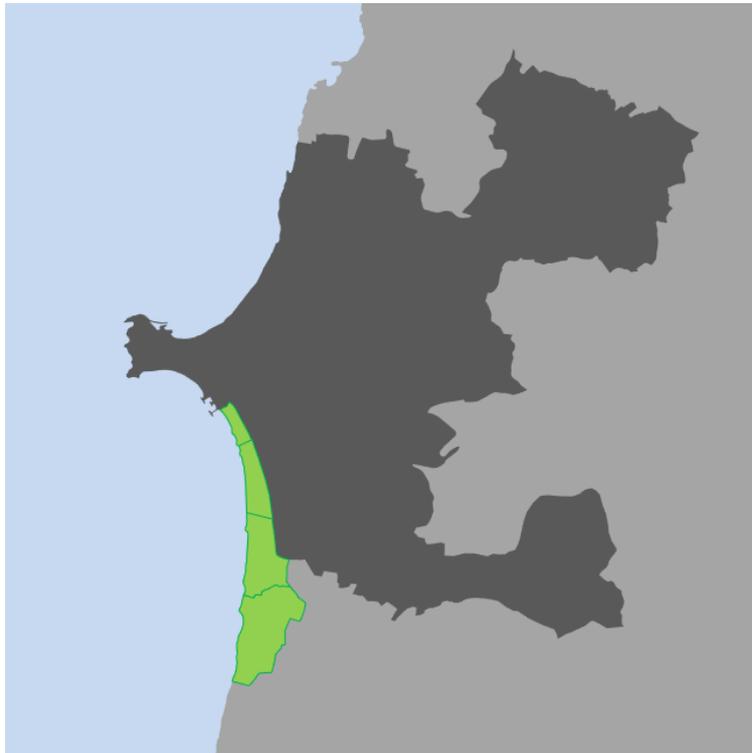
With specific reference to the digitization work performed in QGIS, a complete rework of the TCNR vector was carried out to address the issues. The work undertaken was addressed using mainly Difference Clip and Vertex tools. It aimed at resolving the problems of overlap and gaps between the various polygons within the vector itself and with the other vectors selected for the project. At the end of the work, a consistency and coherence among the following vectors was reached:

- TCNR polygons and area boundaries.
- Tyre municipalities merged.
- Tyre District
- Lebanon Country boundaries.
- Sea polygons.

To align the default visualization of the Lebanese system within PROGES-ISP with the visualization already in place for the Italian and Jordanian systems, the same colours have been selected for representing the sea (light blue), the Country (light grey), and the detailed area where the reserve is located (dark grey).



*After: ISP-PROGES GIS default view detail of Lebanon.*



*After: ISP-PROGES GIS default view detail of Tyre and TCNR.*

## 5. Technical Mentoring “Training By Doing” and Events

The execution of the consultancy tasks and the evaluation of the technical results achieved so far in MED4EBM, benefited from online and in person workshops with the teams of the four Project Partners. The trainings encompassed a comprehensive set of objectives. Firstly, an extensive training in Ecosystem-Based Management (EBM) of coastal zones and marine areas was provided to local technical teams. The training then covered the potential of data analysis, enabling participants to engage in systematic data-driven assessments of ecological conditions. In addition to this, they were empowered with the knowledge and tools required to make informed decisions regarding the sustainable use of the natural resources. The final goal of the technical training was to make the local team proficient in the use of databases and PROGES-ISP as well as defining the next steps for implementing both the systems.

The technical mentoring of the consultancy adopted a "Training by Doing" approach, integral part of the system's improvement, refinement, and enhancement phase. These training sessions actively involved working on the tables, views, indicators, charts, and maps within the databases of Project Partners, along with organizing metadata and refining data collection and updating procedures within the Data Management Toolbox. This hands-on training significantly contributed to the practical improvement and optimization of the system. To facilitate these sessions, a comprehensive step-by-step technical manual was initially prepared and shared with local teams ([Attachment 2](#)).

A central aspect of the missions was also the critical review of System Cause-Effect Analysis report. This process served as the foundation for understanding the intricate relationships between human activities and the environment, offering insights into the root causes of ecological challenges within the target areas. Furthermore, the training addressed the development of management and governance protocols that are essential for effective and long-term preservation of ecosystems. Moreover, with the culmination of the in-person missions, stakeholder national consultation workshops were convened to disseminate the training results and outcomes of the System Cause-Effect Analysis, and so to demonstrate the effective application of EBM approach in the target area.

### 5.1 Mission in Tyre, Lebanon

The mission was carried out for the implementation of Ecosystem-Based Integrated Coastal Zone Management (EB-ICZM) in the Tyre Coast Nature Reserve (Lebanon). The mission lasted from the 22<sup>nd</sup> to the 25<sup>th</sup> of August 2023 and it was divided in three working days with the local technical team and one national consultation workshop.

#### 1.1.1 Day one: 22<sup>nd</sup> August

<b>Meeting Day 1 – Tuesday, 22<sup>nd</sup> August 2023</b>	
<b>Type of meeting</b>	Working group
<b>Meeting focus</b>	ISP training and data entry and analysis
<b>Duration</b>	9:00 – 16:00
<b>EBM National Team</b>	Ali Badreddine, Raghda Saad
<b>EBM Core Team</b>	M. Badran, M. Onori; F. Pella will be online
<b>Time</b>	<b>Subject</b>
<b>9:00-11:00</b>	ISP training; data entry, data analysis
<b>11:00 – 11:20</b>	<b>Break</b>
<b>11:20 - 12:30</b>	ISP training; data entry, data analysis
<b>12:30 – 13:30</b>	<b>Lunch break</b>

<b>13:30 – 16:00</b>	ISP training; data entry, data analysis
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On the first day of the Lebanese mission, in-depth training on PROGES-ISP and database management was carried out in the presence of the local technical team. The training covered the following topics:

- The importance and challenges of using a Decision Support System (DSS) like PROGES-ISP to apply the EBM in coastal zones and marine areas.
- Types of PROGES-ISP input and their importance for the success of EBM: data, documents, models, knowledge, and communication.
- Use of PROGES-ISP as a support tool for the ecosystem context analysis phase and the subsequent System Cause-Effect Analysis.
- PROGES-ISP overview of built-in functions and tools: software interface, system diagram, indicators panel, charts, and maps visualisation.
- PROGES-ISP, SQL Server Management Studio (SSMS) and QGIS software installation and setting up.
- Excel data management: rules for data gathering, data sheets refining and formatting for subsequent uploading into the database and PROGES-ISP.
- DB data management: rules for creation, alteration, and update of tables inside the database. Introduction to SQL queries and views.
- GIS data management: rules for creation and management of vector files (points, lines, polygons), their CRS and attribute table.

### 1.1.2 Day two: 23<sup>rd</sup> August

<b>Meeting Day 2 – Wednesday, 23<sup>rd</sup> August 2023</b>	
<b>Type of meeting</b>	Working group
<b>Meeting focus</b>	ISP training and data entry and analysis
<b>Duration</b>	9:00 – 16:00
<b>EBM National Team</b>	Ali Badreddine, Raghda Saad
<b>EBM Core Team</b>	M. Badran, M. Onori; F. Pella will be online
<b>Time</b>	<b>Subject</b>
<b>9:00-11:00</b>	ISP training; data entry, data analysis
<b>11:00 – 11:20</b>	<b>Break</b>
<b>11:20 - 12:30</b>	ISP training; data entry, data analysis
<b>12:30 – 13:30</b>	<b>Lunch break</b>
<b>13:30 – 16:00</b>	ISP training; data entry, data analysis

On the second day of the Lebanese mission, the training focused specifically on the PROGES-ISP's DMT (Data Management Toolbox) and on the setting up of indicators within the software. A practical demonstration of the whole data management and upload workflow was then carried out.

- DMT: characteristics of the data repository and interface (focus on data source section and target table subsection).
- DMT: importance of enriching the repository with metadata (description of dataset, data source, data type, data collecting procedure, data updating procedure).

- DMT: training on the procedures for filling tables in the database using the DMT’s “Spreadsheet to Db Table” tool.
- Training on setting up of indicators, including retrieving information from the related database table or view. Selection of spatial key, time key, data series and setting up of legend for data visualisation on charts and maps.
- Practical demonstration on data upload workflow: data gathering from UN-Habitat Tyre City Profile 2017 report<sup>1</sup>. Excel table creation with data on Tyre municipality population, GIS vector creation, data uploading into the database and into PROGES-ISP using the Data Management Toolbox. Setting up of the population indicator and visualisation of related charts and maps.
- Introduction to the work to be carried out on the following day concerning data analysis and uploading from marine surveys.

### 1.1.3 Day three: 24<sup>th</sup> August

<b>Meeting Day 3 – Thursday, 24<sup>th</sup> August 2023</b>	
<b>Type of meeting</b>	Working group
<b>Meeting focus</b>	ISP training and data entry and analysis
<b>Duration</b>	9:00 – 16:00
<b>EBM National Team</b>	Ali Badreddine, Raghda Saad
<b>EBM Core Team</b>	M. Badran, M. Onori; F. Pella will be online
<b>Time</b>	<b>Subject</b>
<b>9:00-11:00</b>	System Cause-Effect Analysis; Data review
<b>11:00 – 11:20</b>	<b>Break</b>
<b>11:20 - 12:30</b>	System Cause-Effect Analysis
<b>12:30 – 13:30</b>	<b>Lunch break</b>
<b>13:30 – 16:00</b>	System Cause-Effect Analysis

The third day of the Lebanese mission was dedicated to the finalisation of the System Cause-Effect Analysis. The process was guided by UNDP consultant Francesca Pella. Simultaneously, the work actively involved the local team for the analysis and first upload phase on PROGES-ISP of tables and GIS vectors. Data was retrieved from two marine surveys that were carried out in 2013 and 2017:

- MedMPAnet Report (2013)<sup>2</sup>: Presentation of tables and GIS data retrieved from the report on species abundance, species richness, native status, type of observation and habitat for 25 survey points.
- MedMPAnet Report (2013): Refining of the source Excel table, setting up of new tables with aggregation of data by Class, Order and Family.
- IUCN Report (2017)<sup>3</sup>: Presentation of tables and GIS data retrieved from the report on species abundance, richness, biomass, commercial value, type of habitat for 39 survey points.

<sup>1</sup> UN-Habitat. *Tyre City Profile* (2017). [Download Link](#) (working on 07/09/2023).

<sup>2</sup> Espla, Alfonso A. & Bitar, Ghazi & Khalaf, Gaby & El Shaer, Hany & Forcada, Aitor & Liman, Atef & Ocaña Vicente, Oscar & Sghaier, Yassine & Valle, Carlos. *Ecological Characterization of Sites of Interest for Conservation in Lebanon* (2015). [Download Link](#) (working on 07/09/2023).

<sup>3</sup> IUCN. *Sustainable fisheries management to improve the livelihoods of the coastal fishing community of Tyre, in southern Lebanon* (2017). [Download Link](#) (working on 07/09/2023).

- IUCN Report (2017): Refining of the source Excel table, setting up of new tables with aggregation of data by species status, spatial category, trophic category.
- IUCN Report (2017): Refining of the source Excel table, setting up of new tables with aggregation of data by Class, Order and Family.
- Setting targets and deadlines for uploading data in PROGES-ISP in view of the final phase of the project.

#### 1.1.4 Day four: 25<sup>th</sup> August

<b>Meeting Day 4 – Friday, 25<sup>th</sup> August 2023</b>	
<b>Type of meeting</b>	National Workshop
<b>Meeting focus</b>	Stakeholders Consultation Workshop
<b>Duration</b>	9:00 – 16:00
<b>Participants</b>	EBM National Team + Invited Stakeholders
<b>EBM Core Team</b>	M. Badran, M. Onori; F. Pella will be online
<b>Time</b>	<b>Subject</b>
<b>9:00-10:30</b>	Opening and presentation of TCNR Data and Cause-Effect Analysis
<b>10:30 – 11:00</b>	<b>Break</b>
<b>11:00 - 12:30</b>	Discussion of monitoring and governance protocols, management actions
<b>12:30 – 14:00</b>	<b>Lunch break</b>
<b>14:00 – 16:00</b>	Review and finalisation of governance protocols and management actions

During the last day of the mission, a National Consultation Workshop took place with the participation of stakeholders and institutional representatives from the Municipality of Tyre. A presentation on technical methodology for the implementation of EBM in the project was given. It touched the following topics:

- EBM challenges
- MED4EBM Inputs and Outputs
- Potentialities of using PROGES-ISP
- Role of PROGES-ISP in MED4EBM project
- Interface of PROGES-ISP
- PROGES-ISP tools
- System Diagram
- Indicators, Maps, Charts
- Data Management Toolbox
- Summary of the work done during the mission

### 1.1.5 Mission Conclusions

At the conclusion of the mission, participants received specialized training focused on utilizing the project software PROGES-ISP and its associated tools. Additionally, the session delved into exploring the capabilities of data analysis and effective data management within a database system. Following the training's conclusion, the local team can be deemed adequately skilled and self-reliant in handling data at both the Excel and Db levels. They are now proficient in data loading into PROGES-ISP with the use of Data Management Toolbox. The local team also demonstrated their competence in populating PROGES-ISP's indicators and in configuring the spatial and time keys to get charts and maps.

The groundwork was laid for the upcoming technical tasks and deadlines were set in order to improve and enhance the Lebanese system at all levels. The current state of the system lacks substantial data. However, this situation is expected to undergo significant transformation through the work planned for the next phase. In fact, data on marine surveys have been selected and organized in Excel tables and are now ready to be imported into the system.

## 5.2 Mission in Aqaba, Jordan

The mission was carried out for the implementation of Ecosystem-Based Integrated Coastal Zone Management (EB-ICZM) in the Gulf of Aqaba (Jordan). The mission lasted from the 27<sup>th</sup> to the 31<sup>st</sup> of August and it was divided in four working days with the local technical team and one national consultation workshop. The focus will be mainly on the technical aspects addressed during the mission, with a special attention paid to the improvement delivered on the Project Partner's database and PROGES-ISP systems.

### 5.2.1 Day one: 27<sup>th</sup> August

<b>Meeting Day 1 – Sunday, 27<sup>th</sup> August 2023</b>	
<b>Type of meeting</b>	Working group
<b>Meeting focus</b>	ISP training; data analysis and review
<b>Duration</b>	9:00 – 16:00
<b>EBM National Team</b>	Waed Ajarmeh; Jafar Alomari; Maysoon Kteifan; Abdel Rahman Abu Hamdeh; Abdallah Al-Zoubi, and Technical Specialists of Data Gathering Campaigns
<b>EBM Core Team</b>	F. Pella, M. Onori and M. Badran
<b>Time</b>	<b>Subject</b>
<b>9:00 - 11:00</b>	ISP introduction and training
<b>11:00 – 11:20</b>	<b>Break</b>
<b>11:20 - 12:30</b>	Demonstration of the ISP's implementation
<b>12:30 – 13:30</b>	<b>Lunch break</b>
<b>13:30 – 16:00</b>	Data analysis and review, based on the "Review data JREDS 3 August 2023.docx": feedbacks from the Aqaba team and working plan for the next day

The working group was formed by representatives of the LB, PP3 and ASEZA as the main stakeholder and autonomous government of Aqaba Region. During the first day, a review of the training on PROGES-ISP and database management was performed. The training covered the following topics:

- Review of the importance and challenges of using a Decision Support System (DSS) like PROGES-ISP to apply the EBM in coastal zones and marine areas.

- Review of PROGES-ISP built-in functions and tools: software interface, system diagram, indicators panel, charts, and maps visualisation.
- PROGES-ISP, SQL Server Management Studio (SSMS) and QGIS software installation and setting up.
- Db data management: rules for creation, alteration, and update of tables inside the database. Introduction to SQL queries and views. This part benefited from the integrations of A. Abu Hamdeh.
- Review of tables and views already existing within the database and their match with the Data Management Toolbox's items in the Jordan PROGES-ISP system. This step was needed because it was the first time that the access to the Jordanian database was granted.

### 5.2.2 Day two: 28<sup>th</sup> August

<b>Meeting Day 2 – Monday, 28<sup>th</sup> August 2023</b>	
<b>Type of meeting</b>	Working group
<b>Meeting focus</b>	ISP training; data analysis and review
<b>Duration</b>	9:00 – 16:00
<b>EBM National Team</b>	Waed Ajarmeh; Jafar Alomari; Maysoon Kteifan; Abdel Rahman Abu Hamdeh; Abdallah Al-Zoubi, and Technical Specialists of Data Gathering Campaigns
<b>EBM Core Team</b>	F. Pella, M. Onori and M. Badran
<b>Time</b>	<b>Subject</b>
<b>9:00 - 11:00</b>	DMT introduction and training
<b>11:00 – 11:20</b>	<b>Break</b>
<b>11:20 - 12:30</b>	Finalisation of the tasks of data analysis and review (based on the “Review data JREDS 3 August 2023.docx”) using ISP and DMT. The review will be directly performed in the software.
<b>12:30 – 13:30</b>	<b>Lunch break</b>
<b>13:30 – 16:00</b>	Finalisation of the tasks of data analysis and review (based on the “Review data JREDS 3 August 2023.docx”) using ISP and DMT. The review will be directly performed in the software

The second day, after a practical demonstration of data management and upload into PROGES-ISP, an in-depth review of a set of relevant indicators of the Jordanian system was performed. This step was essential to identify the main areas to be improved on different levels (Db, GIS, PROGES-ISP) and so to have an enhanced or new visualisation of charts and maps. The choice to focus the efforts on few selected topics was driven by the need to review the System Cause-Effect Analysis document and to set up monitoring protocols in the following working days.

- Practical demonstration using data on Chlorophyll a. Excel sheet formatting, Db table management, use of PROGES-ISP's DMT to fill the Db table, setting up of a test indicator and its related charts and maps.
- Choice of the diagram components, and their indicators, of greatest interest for the technical improvement: “Fish” component and its subcomponents; “Corals” component and its subcomponents; “Fishing Activities” component and its subcomponents. “Diving Centre” and “Diving Sites” subcomponents have been selected.
- GIS data management: analysis of the GIS vectors connected to the selected indicators. Correction of their attribute tables and improvement of the quality of digitisation (problems of snapping, overlapping, duplicate vertices); clarification of spatial reference legends.

- Detection and correction of errors for the selected indicators at database level (data type errors and misspells in tables and views), and on PROGES-ISP (legends, visualisation of charts and maps).

### 5.2.3 Day three: 29<sup>th</sup> August

<b>Meeting Day 3 – Tuesday, 29<sup>th</sup> August 2023</b>	
<b>Type of meeting</b>	Working group
<b>Meeting focus</b>	ISP training review; System Cause-Effect Analysis
<b>Duration</b>	9:00 – 16:00
<b>EBM National Team</b>	Waed Ajarmeh; Jafar Alomari; Maysoon Kteifan; Abdel Rahman Abu Hamdeh; Abdallah Al-Zoubi, and Technical Specialists of Data Gathering Campaigns
<b>EBM Core Team</b>	F. Pella, M. Onori and M. Badran
<b>Time</b>	<b>Subject</b>
<b>9:00 - 11:00</b>	Finalisation of the tasks of data analysis and review (based on the “Review data JREDS 3 August 2023.docx”) using ISP and DMT. The review will be directly performed in the software
<b>11:00 – 11:20</b>	<b>Break</b>
<b>11:20 - 12:30</b>	Training on the job: review and finalisation of the System Cause-Effect Analysis combined with the use of the ISP’s “Reporting Tool”, in order to complete the Analysis and to support the Aqaba Team with its informative description
<b>12:30 – 13:30</b>	<b>Lunch break</b>
<b>13:30 – 16:00</b>	Training on the job: review and finalisation of the System Cause-Effect Analysis combined with the use of the ISP’s “Reporting Tool”, in order to complete the Analysis and to support the Aqaba Team with its informative description

The third working day was focused on the finalisation of the System Cause-Effect Analysis document. The process was guided by UNDP consultant Francesca Pella. However, the last technical adjustments at Db and PROGES-ISP levels were performed simultaneously.

- Misspells correction and integration of species names (scientific, English and local names). Focus was mainly put on the table Fish\_Checklist and related views to match the same names entered in the Fisheries\_Catch\_JREDS table and related views at Db level.
- Preparation of data-crossing views between Fish\_Checklist and Fisheries\_Catch\_JREDS tables at Db level.
- Work on Fish\_Checklist indicator: 1) separation of the indicator (endangered status, alien status, commercial value) into three different indicators inside PROGES-ISP. 2) Aggregation of species by Order to reduce the number of observed parameters and make the charts more readable. 3) Setting of endangered status and alien status as spatial keys as workaround for an enhanced visualisation of charts.
- Preparation of views for Fisheries\_Catch\_JREDS table and for new and enhanced visualisation of Occupational Fishing indicators within PROGES-ISP.
- Suggestion for data gathering procedures on Reef Check and its spatial references.

5.2.4 Day four: 30<sup>th</sup> August

<b>Meeting Day 4 – Wednesday, 30<sup>th</sup> August 2023</b>	
<b>Type of meeting</b>	National Workshop
<b>Meeting focus</b>	Stakeholders Consultation Workshop
<b>Duration</b>	9:00 – 16:00
<b>Participants</b>	EBM National Team + Invited Stakeholders
<b>EBM Core Team</b>	F. Pella, M. Onori and M. Badran
<b>Time</b>	<b>Subject</b>
<b>9:00 – 10:30</b>	Opening and Presentation of Aqaba Data and Cause-Effect Analysis
<b>10:30 – 11:00</b>	<b>Break</b>
<b>11:20 - 12:30</b>	Discussion of monitoring and governance protocols, management actions
<b>12:30 – 14:00</b>	<b>Lunch break</b>
<b>14:00 – 16:00</b>	Review and finalisation of governance protocols and management actions

In this day, a National Consultation Workshop took place with the participation of stakeholders belonging to the local community and institutional representatives from the gulf of Aqaba area. A presentation on technical methodology for the implementation of EBM in the project was given with the following topics:

- EBM challenges
- MED4EBM Inputs and Outputs
- Potentialities of using PROGES-ISP
- Role of PROGES-ISP in MED4EBM project
- Interface of PROGES-ISP
- PROGES-ISP tools
- System Diagram
- Indicators, Maps, Charts
- Data Management Toolbox
- Summary of the work done during the mission

### 5.2.5 Day five: 31<sup>st</sup> August

<b>Meeting Day 5 – Thursday, 31<sup>st</sup> August 2023</b>	
<b>Type of meeting</b>	Working group
<b>Meeting focus</b>	Revision of Stakeholders Consultation Workshop
<b>Duration</b>	9:00 – 14:00
<b>EBM National Team</b>	Waed Ajarmeh; Jafar Alomari; Maysoon Kteifan; Abdel Rahman Abu Hamdeh; Abdallah Al-Zoubi, and Technical Specialists of Data Gathering Campaigns
<b>EBM Core Team</b>	F. Pella, M. Onori and M. Badran
<b>Time</b>	<b>Subject</b>
<b>9:00 - 11:00</b>	Presentation of the Contents of the EBM Final Report
<b>11:00 – 11:20</b>	<b>Break</b>
<b>11:20 - 13:00</b>	Planning the writing phase of the EBM final report chapters Any other business
<b>13:00 – 14:00</b>	<b>Closing; Invitation for Lunch</b>

The fifth working day the team finalised the work carried out on the previous days. The input received from the stakeholders during the National Consultation Workshop were discussed and integrated into the work. A review and refinement of the governance protocols and management actions was also performed.

- Final review of the data and of the technical improvement of the system (new indicators, new charts or improved charts and maps).
- Suggestions on data collection sheet for the fishing protocol (subdivision of columns, column names, classification and standardisation of values assignable to each parameter).
- Suggestions on data collection sheet for the glass boats protocol (subdivision of columns, column names, classification and standardisation of values assignable to each parameter).
- Suggestions on data collection sheet for the diving protocol (subdivision of columns, column names, classification and standardisation of values assignable to each parameter).
- First attempt for the creation of GIS maps to be used as support and facilitation for filling tables related to data collection procedures within the framework of monitoring protocols (Annex 3).

During the second part of the day, members from the local team and the UNDP consultants participated to a tour of the glass boats and to a meeting with the fishermen's representatives at the new Aqaba's fish market.

### 5.2.6 Mission Conclusions

The Jordanian technical team demonstrated their already advanced skills in data management at both the Excel and Db levels. As a result, the technical training primarily emphasized the functionalities related to data processing and management within the project software PROGES-ISP. At the mission's conclusion, the local team exhibited full proficiency in employing PROGES-ISP and effectively utilizing its tools, including the Data Management Toolbox. Moreover, the team became proficient in setting up indicators, their spatial and time keys, and in creating their associated charts and maps.

The work undertaken with the local technical team subsequently served to analyze the existing data loaded into the database and their spatial references on QGIS. In the first instance, this cooperative work led to the identification of topics to be enhanced at Db level, where extensive efforts were dedicated to systematizing or creating tables and views, rectifying spelling errors, and refining data types. In a second moment, the focus was on improving GIS vector that served as base maps for data visualisation on PROGESP. Ultimately, these technical interventions aimed to attain a fresh and more polished presentation of the indicators within PROGESP. In the next phase, new improvements will be made both on the socioeconomic and environmental topics that have already been selected in agreement with the local team.

A specific training on GIS (features, input and output data, legends, CRS) is still recommended to be conducted in the upcoming phase of the project. In this way, the local team will be fully independent in managing all the different types of data needed for implementing EBM in the Gulf of Aqaba and for managing the data coming from the various monitoring protocols.

### 5.3 Mission in Rome, Italy

Day	Session
<b>Monday September 18<sup>th</sup> 2023</b>	Work with Matteo: Digitizing Aqaba Marine Reserve Zoning Plan Work with Marco and Matteo: ISP Project Experience and Future Outlook
<b>Tuesday September 19<sup>th</sup> 2023</b>	Work with Marco and Matteo: ISP Project Experience and Future Outlook Work with Matteo: Handling of Data Gathering Campaigns Data

The mission was executed as part of the MED4EBM project during September 18th and 19th. Dr. Marco Faceltta, the PROGESP developer, along with Dr. Badran and Eng. Abdelruhman A. Abu-Hamdeh from the Jordanian Project Partner, participated in the mission. The meeting specifically served as a discussion on GIS, focusing on digitizing Aqaba Marine Reserve Zoning Plan, as integral part of the EBM methodology that includes base and reference vectors for data visualization on maps. More specifically the discussion covered the following topics:

- Introduction of the recently developed Aqaba Marine Reserve Zoning Plan
- Introduction to QGIS: interface, plug-in section, setting of CRS, layer overview panel, layer styling panel, layer order panel, vector editing panel.
- Introduction to Raster data: overview (matrix, cells, pixels), spatial resolution, spectral resolution, principles of raster analysis, types of formats, source of raster data.
- Introduction to Vector data: overview, types of vector data (point, line, polygon), attribute table, vector format extensions (.shp, .dbf, .shx, ...)
- Practical exercise on vector data:
  - Adding, creating, and saving a vector (points, polygons, lines).
  - Setting the Coordinate Reference System of the GIS project and of the vector files.
  - Browsing the vector attribute table and creating, modifying, and populating new fields.
  - Enabling and disabling editing for existing layers.
  - Basic drawing functions for points, lines, polygons.
  - Basic functions of vertex tool and snapping tool.
  - Basic and advanced styling functions (single, categorized, graduated symbols).
  - Basic and advanced labeling functions (by rules).
  - Print layout and map export in different formats.

- Handling of PROGES-ISP’s DMT: uploading and downloading of vector files with the tool "Shapefile to ISP-FTP".
- Digitalisation of Aqaba Marine Reserve’s Zoning Plan, of both the land and marine parts, to be used as a base map for the Jordanian default map whenever the PROGES-ISP system is launched. As a base map, the new vector could also be used as a reference map for visualising AMR data on the GIS visualiser of the software.
- Testing the consistency and accuracy of fishing zones areas according to the official fishing zones in the Jordanian territorial seas within the gulf of Aqaba.

## 5.4 Final Event in Tunis, Tunisia

14:15-17:00	<b>MED4EBM Project Key Interventions</b>
14:15-14:30	MED4EBM Forum: End of the Project and Future Outlook <b>Donovan Baldassarri &amp; Marco F. Falcetta</b>
14:30-15:00	MED4EBM Identified and Mainstreamed Management Protocols: challenges vs solutions and lessons learned <b>Francesca Pella &amp; Ghada Souileh</b>
15:00-15:20	Data Gathering following Citizen Science Principles: MED4EM Aqaba Case Study <b>Mohammad Badran</b>
15:20-15:40	PROGES ISP MED4EBM Experience and perspectives for future capitalization initiatives <b>Marco Falcetta, Matteo Onori &amp; Abdallah Abu Hamdeh</b>

During the final event of the project, held in Tunis on September 21<sup>st</sup>, 2023, a presentation was delivered during the afternoon session titled “PROGES ISP MED4EBM Experience and perspectives for future capitalization initiatives”, part of the event section "MED4EBM Project Key Interventions." The points covered in the presentation, “PROGES ISP Experience and Perspective”, shared with Dr. Marco Falcetta and Eng. Abdelruhman A. Abu-Hamdeh, included:

- EBM challenges, inputs and outputs expected at the beginning of the Project.
- Importance of having a DSS for the implementation of EBM in the four target areas.
- User experience: role of PROGES-ISP in the project in managing the inputs and creating outputs.
- User experience: importance of having a user-friendly interface.
- Final assessment on what PROGES-ISP was during the project and what it wasn’t.
- Future improvements and suggestions for developing the software in the future.

## 6. Results and Recommendations

### 6.1 Results

At the end of the project, and especially following the consultancy work carried out in collaboration with the local teams, all four countries achieved a more than sufficient level of system implementation. Substantial differences have been noticed in the technical level attained stemming from various factors:

- **Outputs from participatory approach:** the outputs from the participatory approach established with stakeholders during the Ecosystem Context Analysis led to the creation of more or less articulated system diagrams within the four Project areas. The creation of the system diagrams influenced the subsequent definition of indicators and the data collection processes. The consultancy has paved the way for further refinement and enhancement of the system diagrams for the four Project Partners, aiming to standardize the ecosystem analysis.
- **Data Availability:** it has emerged as the most complex issue for the technical implementation of the project. The Project Partners adopted diverse strategies when data were not directly available from stakeholders. These strategies include opting for data collection protocols (Jordan), direct field monitoring (Tunisia), gathering data from online bank repositories (Italy), and scraping data from official reports (Lebanon). During the work done with the consultancy, attention was given to preparing the Jordanian system to receive data from the three EBM protocols for data collection. As for Lebanon, a significant effort was made to enhance a system that was still lacking data, thereby maximizing the potential of the system diagram that, before the consultancy, had not been fully realized due to the lack of information linked to the already defined indicators.
- **Data management and visualization:** the attention given to data management within the database, the quality of map and chart visualisation in PROGES-ISP, and the procedures for updating and collecting data reported in the DMT, resulted in the most significant differences among the technical level of implementation reached by the four Project Partners. Throughout the consultancy work, as demonstrated in previous chapters, efforts were made to bridge these differences, and so refining and enhancing systems (especially in Jordan and Lebanon). At the end of the consultancy, the four project areas benefit from more standardized outputs, particularly in terms of data management and visualization on maps and charts.

## 6.2 Recommendations

The improvement and enhancement work for updating the PROGES-ISP software will continue even after the project's completion. This continuous and sustainable system implementation, which includes data updates, new indicators, new maps, and additional metadata on the Data Management Toolbox repository, comes with a set of recommendations. These recommendations should be read as part of the work established in agreement with the local teams to further enhance and optimize the systems.

### 6.2.1 PP2: AdT, Italy

- In the Italian system, the choice of language was clearly determined by the type of interlocutors and stakeholders in the area. Despite this, the entire system, including the system diagram, indicators, and data management toolbox, should be translated into English. This is crucial for creating synergies with other countries and new partners within the FORUM framework established in Tarsia, Calabria. The replicability of the methodology necessitates standardizing results, and the uniform use of a universal language is a necessary prerequisite. Only later, during the exportation of outputs, their commenting, and sharing with stakeholders through specific reports, can one opt for the desired language.

### 6.2.2 PP3: JREDS, JORDAN

- It seems that numerous data parameters were incorporated into the system with ambitious foresight at the project's inception, during the Ecosystem Context Analysis workshops held in presence of the stakeholders. During that first phase of the project, the availability of data and the possibility of their interconnection had not yet been fully considered. This strategy might offer the benefit of utilizing the system primarily as a database to collect data as it becomes available, and certainly, not all gathered data will be employed for additional analysis using the ISP.
- The technical mentoring, based on "training by doing," provided the necessary tools for proper data management within the database and PROGES-ISP. A work has already been done to refine the tables and views in the database, yet it was agreed with the local team that further work has to be done to standardize the database management and prepare for the integration of data from the monitoring and governance protocols activated during the last phases of the project.
- An update of the Data Management Toolbox is still necessary, as, before the consultancy, the significance of this tool, which is an integral part of the EBM methodology and software, has frequently been overlooked. During the consultancy the work for updating the needed information has started, yet it is recommended to meticulously continue reporting all data collection and updating procedures, to ensure that incoming data flows can be easily managed in the future.

### 6.2.3 PP4: INSTM, TUNISIA

- The recommendation is to work on the default visualization of the map in PROGES-ISP to better identify the location of the protected area with a new GIS vector. This is important even if the data available inside the system do not actually pertain to the protected area but have other spatial definition.

### 6.2.4 PP5: TCNR, LEBANON

- At the end of the consultancy, the system is significantly enhanced, with growth in term of number of indicators that now have data, and in term of quality of indicators, with improvements to what was already present in the system. The specific recommendation is to standardize data management within the database. During the "Training by Doing," significant mentoring interventions were required to fix tables and views that were not properly set up or did not meet the minimum standards (in terms of data types, field names, table names) needed for efficiently and easily retrieving data within PROGES-ISP.

### 6.2.5 General Recommendations

These recommendations are not specific to any Project Partner, but at the same time they apply universally to all of them, with the necessary adaptations to account for differences.

- The system diagrams need to be reviewed and adjusted to better depict the ecosystems in light of the findings that emerged at the end of the project. Today, the concept of each project area's ecosystem is different and more advanced compared to how it was described during the initial stages of the project. In the first workshops, indeed, EBM had not yet been implemented, and there were no data available to highlight the true characteristics of each area. It is advisable to revise the diagrams while aiming for simplicity while preserving the representation of ecosystem complexity, eliminating redundant components, and clarifying those that are less clear.
- A work within the databases needs to be done to review all tables and views, in order to standardize database management, and prepare for the integration of data from the monitoring and governance protocols activated during the last phases of the project.
- At the end of the project, some indicators within the software still suffer from inconsistency and inadequacy in terms of data visualization through graphs and maps. Moreover, data series are often set up with superficiality, neglecting the details that would facilitate the correct interpretation of the system's outputs (chart names, axis labels, legends, etc.). The consultancy served to start refining and enhancing the system, focusing mostly on the indicators needed for the System Cause-Effect Analysis revision and for the definition of EBM protocols. Despite this, efforts within PROGES-ISP should still be undertaken to refine the remaining indicators, standardize them, and enhance their visibility and representativeness through the use of graphs and maps.
- It is crucial to establish a clear handover process for data, DB and PROGES-ISP management since the project approaches its conclusion. It is recommended to finalize training for those who will be responsible for managing the system in a sustainable, ongoing, and long-term manner, specifying who they are, how they will take on this responsibility, and when this transition will occur. Without

establishing clarity regarding this handover process, the ecosystem management of the areas according to the proposed methodology and tools is at risk of coming to an end.

- As the implementation of systems with new data will be proceeding, especially with the new EBM protocols established in the Project areas, it is essential to establish a unified methodology for the use of the database and PROGES-ISP. For this purpose, and in anticipation of the handover of the system through specific trainings, it is advisable for various partners to contribute to the modification, improvement, and integration of the manual prepared during the consultancy ([Attachment 2](#)). This would help create a user manual that is a product of the user experience of individual database and GIS experts who have worked on the project.
- An important aspect pertains to GIS vectors. All work conducted on external software and loaded into ISP, especially those involving vectors used as base or reference maps, should be accompanied by metadata (acronyms legend, sources, CRS). This is crucial to ensure the accuracy of analyses and the replicability of analyses in the future. Furthermore, it is advisable to use a limited number of essential GIS vectors and avoid overloading the system with unused GIS vectors, considering the limited processing capacity of the software's GIS visualizer.

## 7. Conclusions

In conclusion, the "Consultancy Final Report" represents the culmination of the Environmental Monitoring and Data Management Expert consultancy, offering a comprehensive synthesis of the entire project's endeavours. The methodology employed during this consultancy aimed to provide technical expertise and support to the Project Partners in environmental and socioeconomic monitoring and data management, all facilitated through the use of the DSS PROGES-ISP.

Throughout the consultancy, a systematic approach was employed to assess, refine, and enhance the systems of the four Project Partners. This included a meticulous evaluation of system diagrams, indicator implementation, GIS vectors, and data repositories, all integrated into the PROGES-ISP software. Technical interventions were then carried out by creating and updating tables and views in the databases, setting up new indicators within the PROGES-ISP software, and improving GIS vectors for enhanced data visualization. These technical interventions were crucial in advancing the functionality and usability of the systems, contributing to the overall success of the project. In addition, the consultancy offered comprehensive technical training through online sessions and in-person workshops, further equipping the Project Partners with the knowledge and skills required to effectively manage their systems and data.

Furthermore, the report not only serves as a retrospective analysis but also as a forward-looking document, providing strategic insights into the post-project phases. A series of recommendations have been laid out, intended to guide the management of existing data, new data generated from protocols, and the integration of new GIS vector data. These recommendations are vital for maintaining the system's flexibility, ensuring harmony with stakeholder inputs, and preventing system overload, thus guaranteeing the continued efficiency, speed, and accuracy of ecosystem analysis in all target areas.

In summary, this consultancy has not only strengthened the environmental and data management capabilities of the Project Partners but has also laid the groundwork for a sustainable and data-driven approach to ecosystem management in the future. The "Consultancy Final Report" stands as a testament to the dedication and collaboration of all involved parties and provides a solid foundation for the continued success of these vital environmental initiatives.