PROGRAMME

Proposal of parameters to be monitored to reach good environmental status on coastal zone

GEF MedProgramme Child Project 2.1 - Mediterranean Coastal Zones Climate Resilience, Water Security and Habitat Protection

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2.1 Mediterranean Coastal Zones Climate Resilience Water Security and Habitat Protection"

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Table of contents

Table of illustrations

FIGURES

TABLES

List of acronyms

EcAp	Ecosystem Approach
EO	Ecological Objectives
GEF	Global Environment Facility
GES	Good Environmental Status
ICZM	Integrated Coastal Zone Management
IMAP	Integrated Monitoring and Assessment Programme of the Mediterranean Sea and coast
MSFD	Marine Strategy Framework Directive
MSSD	Mediterranean Strategy for Sustainable Development
PAP/RAC	Priority Actions Programme/Regional Activity Centre
SDGs	Sustainable Development Goals
WFD	Water Framework Directive

Abstract

This report is focused on an analysis for the identification of parameters to be monitored to measure the progress towards Good Environmental Status on coastal zone, especially dealing with the terrestrial part as the marine part is covered by the EcAp approach and IMAP Decision of the Contracting Parties to Barcelona Convention.

In particular, the peculiar dimension of the sustainable development of the blue economy has been taken into account through the translation of the concept of GES into what is a sustainable evolution and integrated management for coastal zones. To do so, it is proposed to consider the interactions of human activities on the marine and coastal capital. This concept can be implemented in a scalable approach from local to global and vice versa. As a second step for each component of the marine and coastal capital, a core set of existing and innovative indicators is proposed by identifying the pressures on coastal zone (marine and land parts) to be tackled and that all countries could be able to populate, as a common regional basis, useful to support the preparation of different reports on the evolution of coastal zones, and for state of the environmental reports (SoER), among others.

The selection of the indicators was driven in a Science-Policy Interface (SPI) perspective, thanks to a scientific review, a validation with a community of experts before and during a dedicated workshop in order ensure their relevance (RACER) for the endorsement by decision makers with regards to the implementation of IMAP in the Mediterranean.

FRENCH VERSION

Ce rapport se concentre sur une analyse pour l'identification des paramètres à surveiller pour mesurer les progrès vers un bon état environnemental (GES) de la zone côtière, en particulier en ce qui concerne la partie terrestre, la partie marine étant couverte par l'approche EcAp et la décision IMAP des parties contractantes de la Convention de Barcelone.

En particulier, la dimension du développement durable de l'économie bleue a été prise en compte à travers la traduction du concept du bon état écologique qui concerne l'évolution durable et la gestion intégrée des zones côtières. Pour ce faire, il est proposé de considérer les interactions des activités humaines sur le capital marin et côtier. Ce concept peut être mis en œuvre dans une approche évolutive du local au global et vice versa. Dans un deuxième temps, pour chaque composante du capital marin et côtier, un ensemble d'indicateurs existants et innovants est proposé est proposé en identifiant les pressions sur les zones côtières (parties marines et terrestres) à considérer, que tous les pays pourraient être en mesure d'alimenter, comme une base régionale commune, utile pour soutenir la préparation de différents rapports sur l'évolution des zones côtières, et pour les rapports sur l'état de l'environnement, entre autres.

La sélection des indicateurs a été conduite dans une perspective d'Interface Science-Politique (SPI), grâce à une revue scientifique, une validation avec une communauté d'experts avant et pendant un atelier dédié afin d'assurer leur pertinence (RACER) pour assurer l'aval des décideurs pour la mise en œuvre d'IMAP en Méditerranée.

Introduction

In the framework of the Mediterranean Sea Programme: Enhancing Environmental Security (MedProgramme) 2020-2024[1], funded by the Global Environment Facility (GEF), the activity 1.1.5 of Child Project n° 2.1 entitled "Mediterranean Coastal Zones Climate Resilience, Water Security and Habitat Protection", intends to identify a core set of indicators to monitor the Good Environmental Status – GES, in particular on the land part of the coastal zones and to develop a regional conceptual framework for coastal observation.

One activity intends to identify a core set of indicators to monitor GES in particular on the land part of the coastal zones and to develop a regional conceptual framework for coastal observation. The implementation of this activity, in particular, was entrusted to Plan Bleu who appointed a specific team of experts who are developing the related analysis. The activity, in close cooperation with the Priority Actions Programme Regional Activity Centre (PAP/RAC[2]), complements the work undertaken by Contracting Parties to implement the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast (IMAP), with the land part at the national level, in the framework of the UN Environment/MAP's EcAp and IMAP Process, by identifying the necessary monitoring parameters/indicators to measure the progress towards GES of the coast. The activity must consider the growing interest of the decision makers on the blue economy as an opportunity for job and added value creation. Nevertheless, its development can only be sustainable with managed impacts on the environment, in particular on the coastal zones where the land and sea interactions/pressures are focused.

[1] https://www.unep.org/unepmap/what-we-do/projects/MedProgramme
[2] https://paprac.org/

I. The purpose of the activity

This specific activity focuses on the need to identify parameters to be monitored to measure the progress towards good environmental status on coastal zone, especially dealing with the terrestrial part as the marine part is covered by the EcAp approach and IMAP Decision of the Contracting Parties to Barcelona Convention. The Article 16 of the Protocol on ICZM[3] to the Barcelona Convention[4] (UNEP/MAP/PAP, 2008) recognizes that monitoring and observation mechanisms and networks are crucial for the preservation of the Mediterranean Sea and Coasts. In the framework of Barcelona Convention, the Contracting Parties have developed national monitoring programmes based on Common Indicators of IMAP per each cluster namely Biodiversity, Pollution and Litter and Coast and Hydrography. The 23 IMAP Common Indicators cover mainly state and impact indicators. In the case of pollution cluster, UN Environment/MAP is also developing a set of indicators addressing pressures and management responses.

In addition, it must be recalled that IMAP indicators are fully in line with EU directive Marine Strategy Frame Directive (MSFD) even if its implementation is to a legal commitment for EU Member States. MSFD applies to marine waters i.e., the waters, the seabed and subsoil on the seaward side of the baseline from which the extent of territorial waters is measured. MSFD therefore applies to coastal waters as defined by the Water Framework Directive (WFD) and therefore there is overlap, but MSFD only applies for the practical aspects of environmental status that are not already addressed through the WFD. The scope of MSFD is broader than that of the WFD, covering a greater range of biodiversity components and indicators such as marine mammals and seabirds. In other words, where both directives apply in coastal waters, the MSFD covers those aspects of good environmental status not covered by the WFD such as litter, noise, and marine mammals.

The MSFD makes as much use as possible of existing measures and agreements within the WFD because many of the measures to meet the objectives of the WFD will also deliver MSFD targets. This is relevant for the contaminants descriptor where source control in riverine and coastal waters may have significant positive consequences for marine waters. The implications of the extensive geographical overlap with the WFD are also relevant for several other descriptors (e.g. biodiversity, eutrophication, hydrographical conditions) for the objectives of this study in the follow up of the work done under the H2020 PEGASO project (task 4.1).

It has been considered crucial what has been done by PAP/RAC (EcApMED I & II projects) and what is planned to be done (EcApMEDIII project) regarding Common Indicators (CI) 15 and 16. But also the Guidance Indicator factsheets developed for all the IMAP indicators including Marine BD and Pollution & contaminants clusters.

For this study and the benefits of the Barcelona Convention Contracting Parties, the tasks are to provide draft proposals for definition of the concept of GES, specifically by translating the concept of GES into what is a sustainable evolution and integrated management for coastal zones and “dimensions of sustainability” that should be taken into account to achieve the GES in accordance with the sustainable development of the blue economy.

In addition, to meet the need of indicators for the ICZM protocol which could be monitored by the ICZM protocol parties, the study proposes a core set of indicators by identifying the pressures on coastal zone (marine and land parts) to be tackled and that all countries are able to populate, as a common regional basis, useful to support the preparation of different reports on the evolution of coastal zones, and for state of the environmental reports (SoER), among others[5]. For each of them, a factsheet was drafted with the description of the scale of calculation including the identification of the data that can be collected at different scales, especially local and municipal levels. In a next step, the study will identify (i) institutions that may provide/proceed data for each indicator, relying on national information and data to populate indicators and (ii) which information and data are available from countries to monitor the pressures, coastal trends and to contribute to prepare SoE reports.

[3] The ICZM Protocol provides the legal framework for the integrated management of the Mediterranean coastal zone. Under the Protocol, Parties are called to take the necessary measures to strengthen regional cooperation in order to meet the objectives of integrated coastal zone management. Such measures include those aimed at protecting the characteristics of certain specific coastal ecosystems (e.g. wetlands and estuaries, marine habitats, coastal forests and woods and dunes), those aimed at ensuring the sustainable use of the coastal zone, and those aimed at ensuring that the coastal and maritime economy is adapted to the fragile nature of coastal zones.

[4] https://www.unep.org/unepmap/who-we-are/barcelona-convention-and-protocols#:~:text=The%20ICZM%20Protocol%20provides%20the,of%20integrated%20coastal%20zone%20management.

[5] The coastal indicators should focus on physical aspect (states of coastal zones), but also socio-economic aspects and dealing with governance (participatory process, number for inter-ministerial committee, number of ICZM strategies, plans. In addition, the 2 IMAP indicators (Coastline and Land Cover/Land Use) have to be considered in the set.

II. The methodology adopted for the implementation of the activity

The objective of the above-described activity is to prepare a proposal for a core set of indicators on the one hand by enhancing those that are most significant and representative among the already existing and shared ones and on the other hand represent an innovative vision as to the theme of good environmental status. This, together with the need for these indicators to be concrete, measurable and above all comprehensible, adaptable and replicable so that they can be functional to the decision-making processes and thus to the necessary identification of intervention plans and programmes and concrete measures and initiatives to be adopted at national and Mediterranean basin level.

The ambition underlying this activity has therefore made it necessary to adopt an approach that meets the needs of:

- share from the outset the path undertaken, the analyses carried out and the decisions to be taken (participatory approach);
- engage the widest possible representation of the territories involved (territorial approach);
- make use of the contribution of the best expertise in the field to give concreteness to the results to be achieved (result-oriented approach).

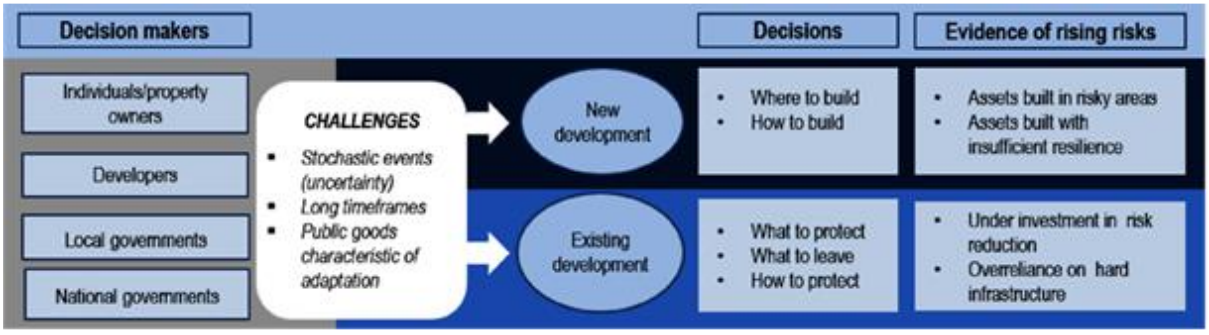
In this regard, it was proposed by the consortium of consultants and then agreed by Plan Bleu to have an online consultation with a small group of experts[6] in the field in order to have their feedback on the conceptual framework adopted and the proposed set of indicators. The proposed indicators were presented during a workshop on 6thJuly 2022 in Plan Bleu's headquarters in Marseilles where the discussions were driven on sharing views on the core set of parameters and indicators which were proposed to be monitored to reach good environmental status in the Mediterranean coastal zone. The main outputs of the workshop were the discussions about the core set of indicators which are included in this report in order to validate at a technical level the draft core set of indicators and prepare the ground to draft a regional conceptual framework for coastal observation. Representatives from six[7] GEF beneficiary countries and a representative of UNEP/MAP/PAP/RAC attended the workshop.

[6] Marta Pascual (Basque Centre for Climate Change), Yves Henocque (Plan Bleu) and Marco Prem (UNEP/MAP/PAP/RAC).
[7] Egypt, Morocco, Bosnia-Herzegovina, Spain, Tunisia, Libya

III. The context

The Mediterranean coastal zones have been under severe pressure during the last decades. Growing and polarization of population and activities on a narrow strip of coastline and the associated transformation of nature and agriculture land into built-up areas have increased the pressure on the coastal zones, damaging coastal ecosystems and causing losses of ecosystem services. The consequences of this littoralization of the development in the Mediterranean were recognized as main drivers of unsustainability of the Mediterranean environment and the Integrated Coastal Zone Management (ICZM) has been considered as a relevant approach to deal with such complex issues. Its complexity is linked to the plurality of the decision makers who are all together facing common challenges in order to ensure on one hand a sustainable development of the coastal zones and on the other hand an effective protection of people and goods. Figure 1 illustrates the difficulties encountered in the decision-making process for coastal areas and the evidence of associated risks to those decision-making processes.

Figure 1. Difficulties arising in the decision-making process for coastal areas (from OECD & Alexander Bisaro, Global Climate Forum)



The development of human activities and its polarization on the Mediterranean coastal areas has produced a negative effect on the quality of these areas and reduced capacities of Mediterranean ecosystems to provide adequate services to Mediterranean societies. This impact is enhanced by the effects of climate change, which have amplified and accelerated the processes of degradation of the natural capital of Mediterranean coastal areas. In this perspective, several concepts must be recalled hereafter to address the objectives of this study.

A. INTEGRATED COASTAL ZONE MANAGEMENT

As part of the answer, the Protocol on Integrated Coastal Zone Management (ICZM) was signed in Madrid, on 21 January 2008, at the Conference of the Plenipotentiaries on Integrated Coastal Zone Management. The signing of the Protocol came after a six-year process of consultation, negotiation and refinement on the Protocol layout and dedicated work of all the Contracting Parties.

Among its articles, we will recall article 5 which recalls the objectives of the ICZM in particular regarding the sustainable development of the coastal zones, the preservation of the coastal ecosystems, landscapes and geomorphology. In conformity with the objectives and principles set forth in Articles 5 and 6 of this Protocol, the Parties shall define indicators of the development of economic activities to ensure sustainable use of coastal zones and reduce pressures that exceed their carrying capacity. In addition with article 16, the" Parties *shall use and strengthen existing appropriate mechanisms for monitoring and observation, or create new ones if necessary".* As a consequence, the Parties have already started defining national capacities to monitor and to report on the ICZM protocol.

Beyond the national commitments to monitor at national level, it is also pivotal to recall in accordance with the article 27 of the protocol, *"the Parties shall in particular define coastal management indicators, taking into account existing ones, and cooperate in the use of such indicators"*.

For several years, the Ecosystem Approach Coordination Group of UN Environment/MAP have been working on the definition of indicators. An Indicator guidance factsheet for EO8 Coastal Ecosystems and Landscapes Common Indicator 25 "Land cover change" was shared and discussed in 2019.

B. GOOD ENVIRONMENTAL STATUS & SUSTAINABILITY

What is a Good Environmental Status (GES)?

The Contracting Parties of the Barcelona Convention committed to apply the Ecosystem Approach with its vision for "a healthy Mediterranean with marine and coastal ecosystems that are productive and biologically diverse for the benefit of present and future generations". The following three strategic goals were identified for marine and coastal areas, on the basis of the relevant priority field of action of the MSFD and the experience gained by other International and regional bodies:

i. To protect, allow recovery and, where practicable, restore the structure and function of marine and coastal ecosystems thus also protecting biodiversity, in order to achieve and maintain a good environmental status and allow for their sustainable use.
ii. To reduce pollution in the marine and coastal environment so as to minimize impacts on and risks to human and/or ecosystem health and/or uses of the sea and the coasts.
iii. To prevent, reduce and manage the vulnerability of the sea and the coasts to risks induced by human activities and natural events.

In 2012, the Contracting Parties adopted 11 Mediterranean Ecological Objectives (EO) to achieve a GES which are in line with the EU Marine Strategy Framework Directive. The Contracting Parties in 2016 agreed on the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria (IMAP) (cf. CoP Decision IG.22/7). The EOs and their indicators are used to draft the Quality State Report (QSR)[8] for the Mediterranean Sea.

A GES illustrates the good health of the ecosystems and their ability to provide services on the location where they are set. The ecosystems as natural resource stocks and space are usually considered as the three principal components of the Natural Capital. "All are considered essential to the long-term sustainability of development for their provision of "functions" to the economy, as well as to mankind outside the economy and other living beings."[9] In this sense, the protection and sustainable use of natural capital are key actions for the achievement of a GES. The EO and their indicators will be considered for the need of this study in particular **EO7 Hydrography** and **EO 8 Coastal ecosystems and landscapes.**

EO7 on Hydrography is to ensure that the alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems and includes one common indicator n°***15: Location and extent of the habitats impacted directly by hydrographic.*** The national monitoring in Mediterranean countries regarding EO7 has not been initiated yet (except for the Contracting Parties that are EU member states, and their obligation of implementing Descriptor 7 of the Marine Strategy Framework Directive), or it is just being initiated. There is no sufficient data to derive conclusions/observe trends on Common Indicator 15 on regional, sub-regional or even national level.

EO 8 on Coastal ecosystems and landscapes is to ensure that the natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved and includes the common indicator 16 "Length of coastline subject to physical disturbance due to the influence of man-made structures". The inclusion of the EO8 Common Indicator aims to address the need for systematic monitoring in the Mediterranean regarding the physical disturbance of coastline due to the influence of manmade structures. It is therefore linked to the ICZM protocol.

Within the EU, GES is a qualitative description concept of the state of the seas which was developed for the EU Marine Strategy Framework Directive (MSFD). Adopted in 2008, the Directive requires its Member states to achieve and to maintain it by 2020. The Directive defines Good Environmental Status (GES) as **"the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive" cf. its Article 3.**

As such, GES would mean that:

- Ecosystems, including their hydro-morphological (i.e. the structure and evolution of the water resources), physical and chemical conditions, are fully functioning and resilient to human-induced environmental changes;
- The decline of biodiversity caused by human activities is prevented and biodiversity is protected;

[8] Decision IG.23/6 - 2017 Mediterranean Quality Status Report
[9] OECD

- Human activities introducing substances and energy into the marine environment do not cause pollution effects, and noise derived from human activities is compatible with the well-functioning of the marine environment and its ecosystems.

The EU Marine Strategy Framework Directive (MSFD) requires member states to manage their marine ecosystems with the goal of achieving Good Environmental Status (GES) of all European Seas by 2020. Member states assess GES according to 11 descriptors set out in the MSFD, and their associated indicators. By nature, all the MSFD descriptors are focused on the environmental status of the marine ecosystem. As a consequence, they are more linked to the impacts of the activities at sea or at land. The Commission Decision on good environmental status of marine waters, adopted on 17 May 2017, contains a number of criteria and methodological standards for determining a GES, in relation to the 11 descriptors of GES laid down in Annex I of the Marine Directive. The Decision also contains specifications and standardised methods for monitoring and assessing marine waters. By highlighting the comparability between ecosystem services and marine and coastal indicators, it is hoped that future monitoring effort can be used not only to ensure that GES is attained, but also that ecosystem services provision is maximized. It is recommended that these indicators should be tested across the Mediterranean Sea to see if they are useful in practice, and if ecosystem service assessments are comparable.

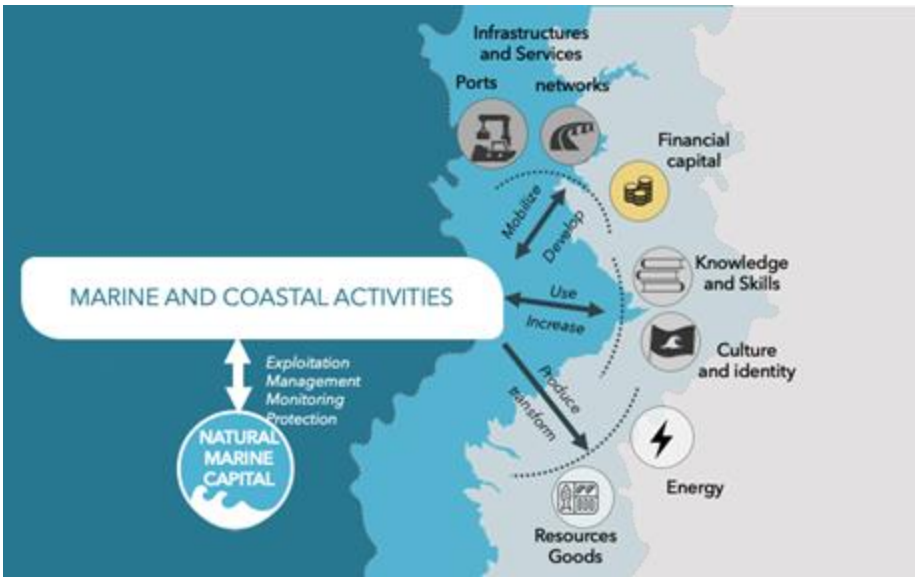
What about sustainability?

The topic sustainability is mainly linked to human activities. This link is to be considered regarding their environmental impacts as for most of them, they need GES on the coastal zones for the access for sustainable resources for fisheries, with healthy and attractive conditions for coastal tourism but also well managed space. Sustainability is not only linked to the environment but also to social and economic development. Activities exist only with knowledge, skills and know-how (human capital) can be engaged for them but also if it is economically viable and financed (financial capital) with existing infrastructures (technical capital).

By doing so, we are in line with the SDGs where their successful implementation requires striking a balance between socio-economic progress, sustaining the planet's resources and ecosystems, and mitigating climate change impacts.

Every marine or coastal activity interacts with the different types of marine and coastal capital: natural capital (e.g. marine resources), human capital (e.g. knowledge and skills), produced capital (e.g. infrastructure, services) and financial capital in accordance with the institutional capital (institutions and policies).

Figure 2. Marine and coastal activities interactions with the territory (@SML)



How do these interactions take place? Different parts of the Marine and Coastal Capital are used or developed during these interactions, as illustrated below.

For each activity, the level of added value at the national level is assessed regarding its use and contribution to the marine and coastal capital. The level of use and contribution/added value should be balanced, otherwise the amount of capital is depleted.

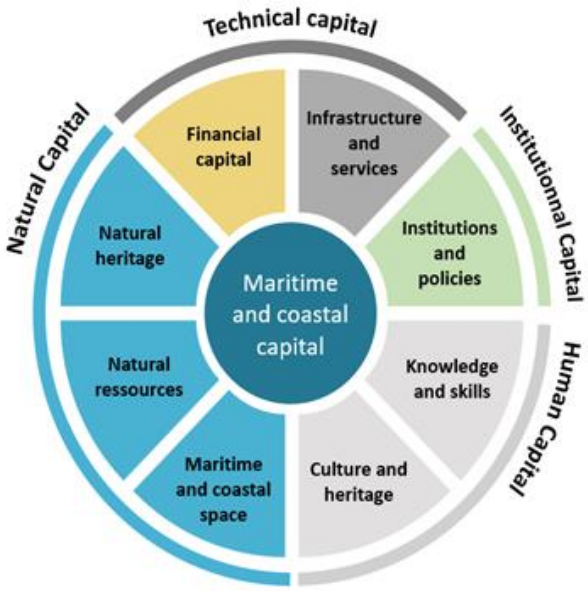
The recovery of the GES and the development of a sustainable (blue) economy on the coastal zones, the engagement of stakeholders, in particular the local ones, is pivotal with the implementation of tools such as ICZM and MSP with dedicated frames, plans and adapted governance.

All these ingredients compose what we call the "institutional capital" which includes the level of cooperation. Its level of development illustrates the readiness and the willingness of the stakeholders and public authorities to cooperate on marine and maritime issues.

Based on these statements and for the purpose of this study, we propose to consider the concept of "marine and coastal capital" as depicted in the illustration.

We consider that each coastal territory has a Maritime and Coastal Capital (Figure 3) which is the basis for the development of all marine and coastal activities.

Figure 3. Maritime and coastal capital (@SML)



The **Natural capital** comprises:

- *Marine and coastal space*: coastline (various types), maritime zones and characteristics (bathymetry, etc.), islands, lagoons, etc.: space is the fundamental support for all marine and coastal activities, and coastal space is vital for the Blue Economy (all marine activities begin and end at the coast).
- *Natural heritage*: marine and coastal landscapes and ecosystems (including habitats and species) and associated ecosystem services.
- *Natural resources*: biological resources which are provided by the ecosystem (fish, algae…), energy resources (wind, waves, currents, heat, tides etc), and mineral resources.

Human capital is composed of:

- Marine and coastal knowledge and skills: (applied, scientific, theoretical, or practical) which can support marine and coastal activities and/or improve marine and coastal capital. This includes traditional knowledge and skills (sometimes referred to as marine and coastal cultural heritage) and its physical and non-physical components.
- Culture and heritage:

Institutional capital refers to the cooperation between stakeholders, their commitment to work together and to act with the necessary frameworks, regulations, and policies to facilitate institutional working. Institutional capital is necessary to support any decision and any action associated with the management of marine and coastal activities, as the space and resources are usually shared between many stakeholders, and decisions or actions (private or public) overlap or conflict with the decisions or actions of others.

The Technical capital includes:

- **infrastructures and services** including all the infrastructure facilities provided to support marine and coastal activities, including services (e.g. communications, meteorological and physical oceanographic services; water and energy supply; waste treatment)
- **financial capital** which is the capacity to invest or support public and private investment to guarantee capital to support maritime and coastal activities. It also includes within the broader produced capital component, the attractiveness for public and private funds / investments.

The combination of these forms of capital is the sum total that a country/territory can use for the development of marine and coastal economic activities in the context of the blue economy.

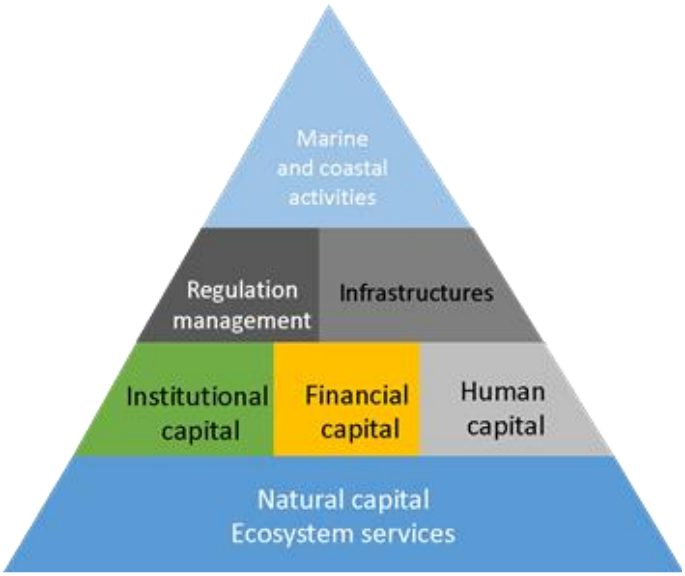
Marine and coastal capital should be preserved, adapted, increased or optimised, so that it can be passed to future generations. Therefore, a key part of this diagnosis, beyond an inventory of the marine and coastal capital, is an understanding of the relationship between the capital and the economic sectors, be they positive, negative, neutral, existing or anticipated.

Not all countries are equal as far as marine and coastal capital is concerned. Some have large ocean areas, with a wealth of natural resources (biodiversity, raw materials, energy resources) and / or long coastlines favourable to the development of marine activities, while other countries do not. This overview of the maritime and coastal capital is important to understand how related activities whether depend on, or contribute to, the capital. It also highlights the role of natural capital in future economic potential in particular with a set of indicators.

Marine and coastal activities can be sustainably and viably developed based on a pyramid (see Figure 3) comprising the following fundamental elements:

i. Existence of a natural capital providing (i) the ecosystem services for/from living resources and (ii) the non-living resources. the existence / availability of a natural capital requires protection, management and regulation.
ii. Availability of a strong human capital, to provide the necessary skills and knowledge to regulate and manage effectively marine and coastal activities. Capacity building may be required to develop this human capital.
iii. Availability of financial capital and produced capital to support activities.
iv. Availability of institutional capital to guide action and regulation.

Figure 4. Sustainability pyramid (@SML)



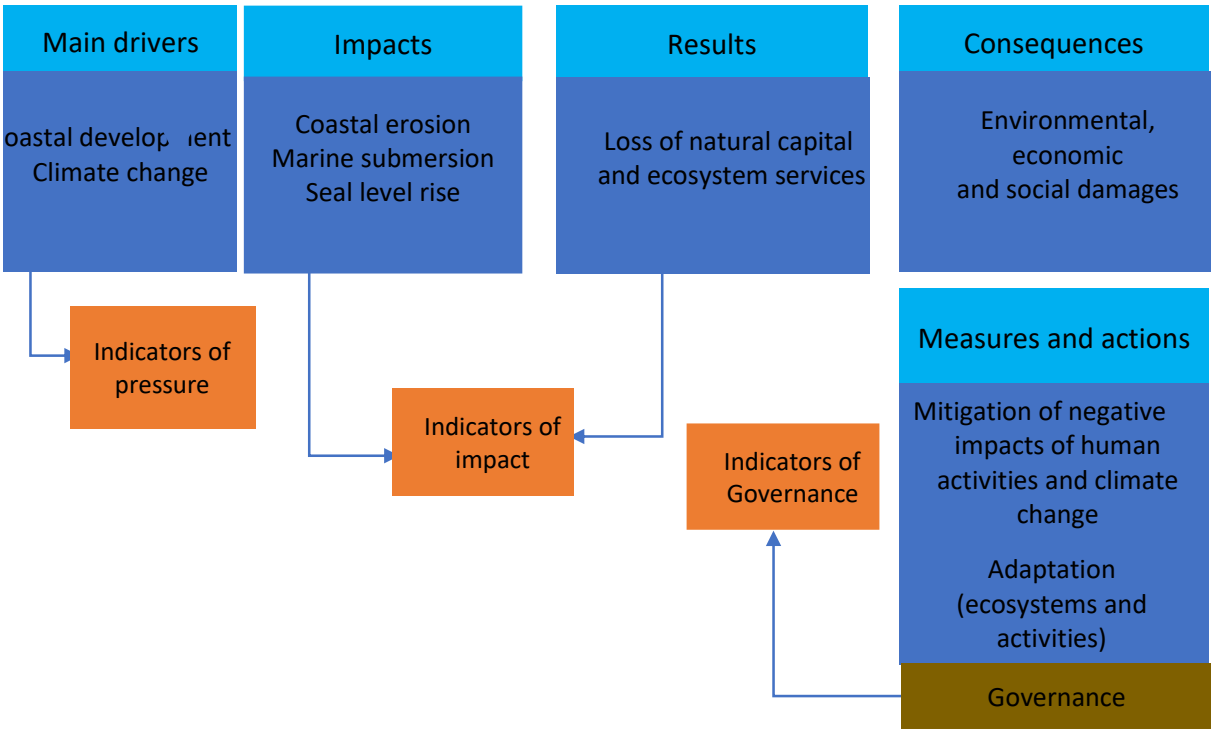
We propose to consider the concept of sustainability based on the availability and the development of the marine and coastal activities for the selection of the indicators for the study. The selection will be presented for each component of the maritime and coastal capital in order to give an integrative overview of the indicators all along the components of the capital.

IV. General framework for the study

Environmental indicators are essential statistical tools for monitoring progress in the field of coastal zone preservation. These indicators also support policy assessments and public information. The organization of the general framework for monitoring the environmental dashboard of the coastal zones is fundamental for transparency and thus for good governance. Thus, environmental performance, through indicators, can be assessed with respect to national targets and international commitments.

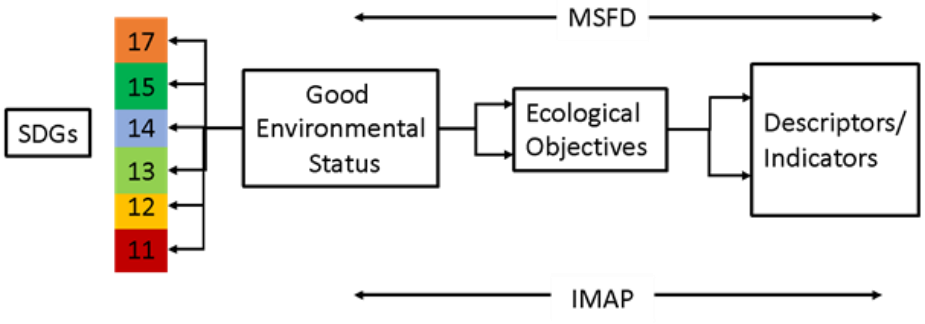
The logical framework for the selection indicators is presented in Figure 5 by the identification of the main drivers, the impacts, the results and the consequences in order to monitor the effects of the action or measures.

Figure 5. Pressures driving the changes on coastal zones and measuring the conversion of coastal zones



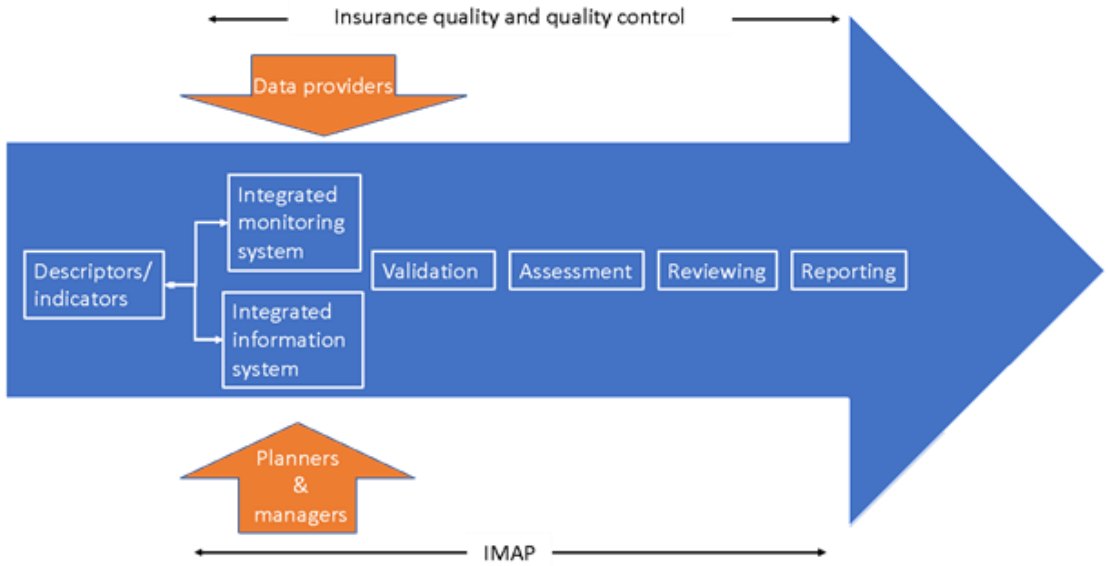
As presented on the Figure 6, the choice of the indicators is also driven by the way to meet the ecological objectives in a global approach (GES recovery in accordance with IMAP or MSFD) and also to contribute to meet the UN SDGs on the coastal zones such as SDG 14 (life below water), 13 (Climate action), 12 (Responsible consumption and production) and 11 (Sustainable cities and communities).

Figure 6. Interlinkage between frames for the recovery of the marine and coastal GES (@SML)



The Figure 7 illustrates the contribution of data providers, the demand of the planners and managers towards an integrative system on which the indicators must contribute on the reporting for the GES and SDGs. This is based on the strong link between the integrated monitoring system (observatory) and the integrated information system. The definition, the selection and the adequacy of the indicators to report on the GES are part of the insurance and quality control. Finally, the processes are conducted under an organized framework considering four key steps: validation, assessment, reviewing and reporting.

Figure 7. General framework of coastal indicators (Adapted from Grimes, 2019)



For the purpose of the study, it is pivotal to keep in mind that the Barcelona Convention compliance committee[10] has recommended developing a set of indicators measuring progress in implementation of Barcelona Convention and its protocols such as legal environmental indicators for measuring the effectiveness of the Barcelona Convention and its Protocols[11].

Indicator of compliance	Source of information
Existence of ICZM law	National
Existence of inter-ministerial committees for ICZM	National
Existence of national ICZM strategies	National/MAP
Existence of regional(s) (subnational) of local ICZM plan(s)	National/local
Existence of national ICZM strategies	National/MAP
Existence of entity formally dedicated to ICZM	National
Existence of national formal ICZM report	National

Regarding National Coastal Strategies, Plans and Programmes, Transboundary Cooperation (Article 18 of the ICZM protocol), the Committee concluded that a common methodology for interpreting the nature or undertaking the assessments of the use and management of the coast is missing. This may be an area for further development.

To urge and recommend the Contracting Parties concerned to adopt national strategies for ICZM to be implemented at appropriate territorial level through coastal plans and programmes, and **to develop indicators for evaluating the effectiveness** of these strategies, plans and programmes. Therefore, the choice of the indicators must meet at the same time the national needs to implement and monitor the national strategies and to report at the regional level.

[10] The Barcelona Convention Compliance Committee reflects the firm commitment of the 22 Contracting Parties to the Barcelona Convention to achieve implementation of and compliance with the Barcelona Convention and its Protocols. it facilitates and promotes compliance with the obligations under the Barcelona Convention and its Protocols

[11] Decision IG.24/1 - Compliance Committee (UNEP/MED IG.24/22)

Regarding economic activities (Article 9 of the ICZM protocol), the use of indicators to evaluate economic impacts on the coastal zone is limited with very little comprehensive activity in this field and this urges the Contracting Parties concerned to define in national legislation specific **economic indicators relating to the sustainable use of the coastal zone**.

For the strategic outcomes and indicative key outputs for governance[12], it has been recommended that the MSSD implementation should be monitored, as appropriate and evaluated, as appropriate on a periodic basis through the **agreed set of indicators in line with SDGs and the Mediterranean sustainability dashboard**. Finally, fact sheets for ICZM indicators should be developed to evaluate the effectiveness of coastal and marine resources management measures.

In the context of the study which is to agree on the efficient and relevant way to monitor to reach good environmental status on coastal zone, it is proposed to consider the related **current indicators of assessing GES achievements** namely**:**

- **EO7 Hydrography:** Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems.
  - Common Indicator 15: Location and extent of the habitats impacted directly by hydrographic alterations (EO7) to also feed the assessment of EO1 (Biodiversity) on habitat extent.

The link to EO1 is essential, because a map of benthic habitats in the zone of interest (broad habitat types and/or particularly sensitive habitats) is required to provide a baseline to assess the level of alteration of coastal zones. Therefore, identifying the priority benthic habitats for consideration in EO7 together assessment of impacts, including cumulative impacts, is a cross-cutting issue of high priority for EO1 and EO7.

- **EO 8 Coastal ecosystems and landscapes:** The natural dynamics of coastal areas are maintained, and coastal ecosystems and landscapes are preserved.
  - Common Indicator 16: Length of coastline subject to physical disturbance due to the influence of man-made structures (EO8);
  - Candidate Indicator 25: Land use change (EO8).

For EO8, the choice of a fixed reference coastline between the Contracting Party is requested in order to assure comparability of results between successive reporting exercises. Unfortunately, it is not unusual to find out that more than one 'official' coastline exists for the same Contracting Party produced with different technological techniques. In addition, coastlines change due to coastal erosion, sea level rise and morphological modifications. If spatial resolution is too low or time period is too long, man-made structures could be poorly identified or completely missed with heavy consequences on the calculation of length of artificial coastline.

The three above-mentioned IMAP indicators are directly linked to the natural capital (marine and coastal space) and therefore on the conditions to maintain or develop a sustainable blue economy as reported in the following Table 1.

Table 1. Link between IMAP indicators and natural capital

	Common Indicator 15	**Common Indicator 16**
Maritime and coastal activities (services)	Location and extent of the habitats impacted directly by hydrographic alterations (EO7): Assessment of EO1 on habitat extent	Length of coastline subject to physical disturbance due to the influence of man-made structures (EO8)
Coastal and maritime tourism		Loss of tourism space in particular for ecotourism
Fisheries	Loss of productivity and production	Loss of fishing port functions
Aquaculture	Loss of productivity and production	Loss of aquaculture areas Loss of aquaculture port functions
Coastal agriculture	Loss of productivity and production	Loss of agricultural space through salinization of land and coastal aquifers
Cultural heritage		Loss of maritime and coastal archaeological and cultural heritage
Coastal cities		Loss of coastal housing
Energy and renewable energy		Loss of potential energy areas

[12] UNEP/MED IG.24/22 - **Decision IG.24/2 - Governance**

In addition, a selection of indicators which are significant for hydrographic and coastal issues and covering both the environmental (Good Environmental Status) and socio-economic aspects is proposed. Their choice was made on the basis of an analysis of the different strategic frameworks that have a link with the evolution of the Good Environmental Status of the Mediterranean coasts:

- Mediterranean Strategy for Sustainable Development (MSSD 2016-2025);
- Sustainable Development Goals (SDGs);
- European Union's "DEDUCE" project;
- The different coastal management plans (CAMP);
- FP7 (European Commission seven framework programme) PEGASO Project.

Some of the indicators are proposed to assess the performance and efficiency of the governance processes involved in integrated coastal zone management, focusing on the need to complement process-oriented indicators with outcome-oriented indicators to improve adaptive management and accountability. The choice of the indicators must also consider the availability of data sets which are available at national levels. As a consequence, it is also important to consider the "Mapping Report of Mediterranean observatories and monitoring programmes for the environment and for marine and coastal activities".

The approach used in the selection of the indicators is in accordance with the principles of ICZM (Article 6 of the Protocol) reflecting the relationship between Integrated Coastal Zone Management and the Ecosystem Approach. The selected indicators are to be evaluated by using the RACER methodology to identify the most appropriate indicators. The RACER assessment assigned each indicator a score between 1 (lowest) and 4 (highest), according to the following criteria:

- **Relevant**: relevant to sustainable development issues, i.e. in relation to the MSSD, the Sustainable Development Objectives (SDGs)
- **Accepted**: widely accepted by key stakeholders, scientific experts and policy makers.
- **Credible**: transparent, easy to interpret and understand for the intended audience.
- **Easy**: data accessible in open databases (World Bank...).
- **Robust**: reliable data, regularly and systematically updated.

Criteria	indicator statement
Relevant	Management objectives and scientifically valid and part of the management process and not an end to themselves. With a clear link to the environmental outcome being monitored
Accepted	Accepted and clearly documented methods and units
Credible	Unambiguous and capable of being monitored easily to show trends over time. Understandable, so they enlightened users about program or coastal governance performance
Easy	Simple and cheap as possible (while achieving the desired results)
Robust	Providing early warning of emerging issues or problems and adaptable for use at a range of scales, wherever possible.

The criteria of availability of data should also be taken into consideration, as not all countries have information, observation and indicator calculation systems with the same level of performance.

It is therefore recommended to analyze the proposed indicators according to their availability and to establish a hierarchy according to the countries and their capacity to deal with these indicators in the short term and to have a second set of relevant indicators, but which will require the preparation of the countries in order to be able to deal with them in the medium term.

The selected criteria are ranked from 1 to 4 according to their level of feasibility: 4 is for a maximum of agreement on the criterion and 1 for the lowest level of relevance (Table 2).

Table 2. Ranking of criteria

Criteria	4	3	2	1
Relevant	Cleary linked to governance performance and scientifically valid	Limited links to governance performance nevertheless scientifically valid	Limited links to governance performance, scientifically ambiguous	Weakly linked to governance performance
Accepted	Fully accepted and clearly documented with methods and units	Accepted with partial difficulties to be documented with methods and units	Weak consensus and difficulties to be documented with methods and units	Very weak consensus with strong difficulties to be documented with methods and units
Credible	Unambiguous and fully capable to be monitored in order to easily show trends over time. Understandable.	Unambiguous, with partial difficulties to be monitored to show partially trends over time. Understandable.	ambiguous, with difficulties to be monitored to show partially trends over time. Slightly understandable	ambiguous, with strong difficulties to be monitored, does not link clearly with trends over time.
Easy	All Mediterranean countries are able to report on reliable indicator on a regular basis	A large part of the Mediterranean countries is able to report on the indicator reliable indicator on a regular basis	Only part of the Mediterranean countries is able to provide on the indicator with a partial reliability and on an irregular basis	Few Mediterranean countries are able to report on the indicator
Robust	Providing early warning of emerging issues or problems adaptable for use at a range of scales, wherever possible	Providing early warning of emerging issues limited adaptability for use at a range of scales	Providing weak early warning of emerging issues	far from early warming of emerging issues

Insurance quality/indicators

Rely on Quality Controls (QCs) and a Quality Assurance (QA) process that ensures effective implementation to efficiently improve the quality of data collected and published by the IMAP pilot information system. As part of the QA process, reference will be made to the definitions given for data standards (DSs), data dictionaries (DDs), and associated official controls (QCs) for the monitoring modules associated with EO5, EO9 and EO10 and the IMAP Common Indicators (UNEP/MED WG.467/12)[13].

[13] IMAP Pilot Information System, data standards and data dictionaries, quality assurance issues and first Elements of IMAP data Management policy (7th ecosystem approach coordination group meeting. Athens, Greece, 9 September 2019).

V. Tentative list of indicators

The list has been established under each component of the maritime and coastal capital considering the indicators which can be assessed regarding its availability, its potential development and its sustainable use. Some of the proposed indicators related to Percentage of new development of brownfield land on previously developed land and Area converted from the non-converted to developed land use (Development of brownfield land), Percentage of built-up land by distance from the coastline and Percentage of length of the coast urbanized (Area of built up land), Proportion of agricultural land farmed intensively (Land take by intensive agriculture) can be calculated from the Land Cover Land Use (LCLU) indicator that is already on the List of IMAP indicators.

This approach can also demonstrate the complementarity with the already existing indicators defined in IMAP and show the consistency with the proposed new set of indicators. Beyond the relevance of the indicators, the criteria of data availability should also be considered, as not all countries can access similar information, observations, and comparable performance for indicator calculation-systems. In addition, it is recommended to establish a hierarchy that fits for each country according to its capacity to handle these indicators in the short term. In this perspective, countries will act in two stages. In the first step (2023-2024) by mobilising necessary resources to meet the priority indicators and in a second phase (2024-2025) to start meeting the second order indicators.

Special note: Based on the outcomes of the first workshop which stood in July 2022, the tentative list was divided into a first list of indicators considered with a high priority and another one with lower priority. This ranking is to be confirmed by the project's beneficiaries' countries in future steps.

Each criteria was tagged as conventional or innovative.

Conventional ones are to ensure the continuity in existing indicators which already exist without being considered as dedicated for the purpose of the study.

Innovative ones are new criteria which have never been implemented but considered as promising for the study.

A. PRIORITY INDICATORS

Block 1 - Natural capital (marine and coastal space)

Indicator 1 - Demand of property at the coast (conventional)
• **Measurement of size, density of the population living in the coastal zone**
This indicator reflects part of the coastal ecological footprint as it is based on the demand for required space (surface) needed to develop activities compared to the availability (supply of space) and thus indirectly to the bioavailability.
Way to express: Number of inhabitants/km^2 in the coastal local administrative units
Unit: Number of inhabitants/km^2
Elements of interpretation: The interest of this indicator is to compare the density of the population living in the coastal zone with the density of the population living in the hinterland due to the level of demographic pressure.
Link with existing indicator: http://www.coastalwiki.org/w/images/b/bd/PEGASO_Population_size_and_density.pdf
Source: local /urban statistics provided by national statistics, urban and coastal institutes and agencies

Indicator 2 - Development of industrial land - use for industrial land (conventional)
● **Percentage of industrial lands on the coastal zones (established)**
The new area dedicated to industry in coastal zones has become higher than that of the regenerated ones. Intensive development of brownfield land reduces the quality of the social and economic setting of coastal cities and may have a negative impact on coastal and marine ecosystems.
Way to express: sum of the surface of new development (industry) / sum of the surface of existing industrial infrastructures With reference period 1 year/5 years/10 years in the coastal local administrative units
Unit: Surface of area expressed in %
Elements of interpretation: need to consider the surface, the distance from the sea, the nature of industry and technology which are deployed/set, industrial lands on the coastal zones versus industrial land in inland (National average)
Link with existing indicator: http://www.coastalwiki.org/w/images/4/46/PEGASO_Area_of_built-up_space.pdf
Source or associated indicator: Land Cover Land Use (LCLU) indicator to detect the change of the surface modified by the new use of the industry
● **Area converted from the non-converted to developed land use (innovative)**
It measures the size (surface) of coastal areas converted for human activities compared to the original unconverted surface. This indicator gives a precise idea of the level of artificialization of coastal land.
Way to express: sum of the surface with human activities / sum of the surface of unconverted areas Reference period 1 year/5 years/10 year in the coastal local administrative units
Unit: Surface of area expressed in %
Elements of interpretation: type of conversion, distance from the sea (3 years)
Link with existing indicator: http://www.coastalwiki.org/w/images/4/46/PEGASO_Area_of_built-up_space.pdf
Source or associated indicator: Land Cover Land Use (LCLU) indicator to detect the converted surface modified by the new human uses on the coastal zones

Indicator 3 - Area of built-up land
● **Percentage of built-up land by distance from the coastline (conventional)**
It measures the urban footprint from the coastline therefore the level of pressure associated with urbanization. It is to be linked with the density of the population on the seashore.
Way to express: surface of artificialized areas in the coastline (land depth to be defined) in the coastal local administrative units
Unit: Surface of area expressed in %
Elements of interpretation: type of build-up (3 years), administrative and natural scales, build-up land in coastal zone versus inland (National average)
Link with existing indicator: http://www.coastalwiki.org/w/images/4/46/PEGASO_Area_of_built-up_space.pdf
Source or associated indicator: Land Cover Land Use (LCLU) indicator to detect the converted coastal surface by the urbanisation
● **Percentage of length of the coastline urbanized (conventional)**
It is to evaluate the level of effectiveness and efficiency of the spatial planning instruments of the coastal zone and to see if the policies of urbanization and urban extension control bring concrete results to reduce the ecological footprint of the construction and the habitation. It also assesses whether adaptation measures against coastal hazards such as coastal erosion are effective.
Way to express: length of artificialized areas in the coastline in the coastal local administrative units

Unit: % of length
Elements of interpretation: coast length urbanized / Total coastline (3 years)
To be derived from surfacic indicator
Source or associated indicator: Land Cover Land Use (LCLU) indicator (TBC)

Indicator 4 - coastal erosion
• **Proportion of the coastline affected by coastal erosion (innovative)**
This indicator measures the intensity of coastal erosion per type of geomorphology of the coast and assesses whether adaptation measures against coastal hazards such as coastal erosion are effective.
Way to express: surface of affected coastal line/total of coastal line (temporal reference 3-5 years)
Unit: km and for the temporal reference 3-5 years in the coastal local administrative units expressed in % (coastline affected by coastal erosion from the total coastline
Elements of interpretation: length of coastal areas lost (beaches or rocky coast)
Link with existing indicator: Erosion Hotspots (EUROSION)
Source or associated indicator: satellite observation

Indicator 5 - Allocated space for maritime infrastructure
• **Level of permanent occupation of the sea for maritime activities (innovative)**
This indicator measures the extent of infrastructures related to fisheries and other maritime activities such as aquaculture, energy, port activities, shipbuilding and repair, maritime tourism and also indirectly the risks on marine living resources.
Way to express: km^2 for permanent allocated space for maritime activities on the coastline in the coastal local administrative units
Unit: km^2
Elements of interpretation: it considers the sea and the coastal surfaces and the link with marine and coastal infrastructures which have been set for marine activities and terrestrial activities depending on marine resources (ex. land part necessary to offshore exploitation, land infrastructure of marine aquaculture, desalination terrestrial infrastructures, etc.).
Link with existing indicator: NA (TBC)
Source or associated indicator: urban register and remote sensing

Block 2 - Technical capital (Financial capital)

Indicator 10- Percentage of environmental taxes collected (innovative)
Measures the level of application by the administration and the control and monitoring services, the level of implementation of the polluter pays principle and more generally of environmental legislation. Where possible, economic incentives should be used, particularly taxes and charges. It is suggested, however, that economic incentives should not substitute command-and-control action. Economic incentives have the potential to complement governmental action.
Way to express: Percentage of environmental taxes collected on the coastal zones regarding their impacts on the coastal and marine environment but also for their use (resources, space)
Unit: %
Elements of interpretation: By category of taxes, any taxes related to: - Wastes treatment tax - wastewaters treatment tax - Marine and coastal protected areas entry fee - Atmospheric pollutants tax,

- Coastal housing, tourism activities tax.
Link with existing indicator: NA
Source or associated indicator: local or national fiscal administration

Block 3 - Institutional capital

Indicator 9- Structures (Governance and frames)
● **Existence of related Plans/frames (conventional)**
To mirror the governance for ICZM and MSP, plans, strategies or frames are requested to ensure the implementation of a sustainable blue economy.
Way to express: existence and number of frames – any link between the national level from local to national
Unit: NA
Element of interpretation: it considers the formal or non-formal existence of strategies and plans, scales, temporal horizon, effectiveness, link with other national sectoral strategies and plans for a sustainable development on the coastal and marine spaces
Link with existing indicator: NA (TBC)
Source or associated indicator: national administration
● **Percentage of the marine zone covered by MSP legal tools (conventional)**
In link with the existence of the frame, it is important to have as much as possible a large part of the marine spaces with MSP regulation which includes the process for its definition, implementation and revision. It measures the effort of management. Cautiousness must be paid on the effectiveness of the implementation.
Way to express: Percentage of marine spaces under MSP regulation (comparing to surface of waters under national jurisdiction)
Unit: %
Elements of interpretation: effectiveness of MSP tools, national/local dedicated bodies coordinating MSP tools and processes, MSP sectors.
Link with existing indicator: NA (TBC)
Source or associated indicator: national administration

Indicator 11 - Application level of environmental legislation (innovative)
For evaluating the performance of the governance systems in coastal zones in implementing policies and programs for effective environmental enforcement. The objective is to document current efforts to implement criteria and processes for evaluating the effectiveness of the respective environmental enforcement policies, programs and strategies. It also supports the analysis of trends in performance on environmental legal application with a view to establish a baseline. This indicator measures the level of environmental awareness of coastal zone stakeholders, in particular users and resource exploiters. It also measures the effectiveness of the control and monitoring system in place. Providing public reports on actor's fulfilment of their enforcement obligations.
Way to express: *Number of inspections, record reviews, responses to citizen complaints, and investigations conducted* (Monitoring Compliance) **or** *Number of notices issued, civil and criminal actions initiated and concluded, and self-policing settlements concluded* (Enforcing the Law).
Unit: Number or a percentage
Elements of interpretation: effectiveness, compliance with formal and legal provisions, coastal compliance versus national compliance. The evaluation of regulatory efficiency can be measured through: the number of statements of offense to environmental legislation (T1), the number of offense leading to administrative sanctions (T2) or the number of offense leading to court decisions (T3) with either T1, T2/T1, T3/T1 or T3/T2
Link with existing indicator: NA
Source or associated indicator: Local and national administration

B. SECOND PRIORITY INDICATORS

Block 1 - Natural capital (marine and coastal space)

Indicator 6– Land take by intensive agriculture
• Percentage of agricultural land farmed intensively
It measures the level of active cultivated areas versus the farming ones where human actions are lower.
Way to express: surface of cultivated areas (including greenhouses) in the coastal local administrative units
Unit: Surface (km^2) expressed in %
Elements of interpretation: coastal versus inland, type of agriculture, production of wastes, use of fertilizers.
Link with existing indicator: http://www.coastalwiki.org/w/images/4/46/PEGASO_Area_of_built-up_space.pdf
Source or associated indicator: satellite observation or agricultural land register

Block 2.1 – Technical capital (Infrastructures and services)

Indicator 7 – Demand for road travel at the coast
• Volume /flow of traffic on the motorways and major roads (innovative)
Indirectly measures the economic dynamics of the coastal area and directly measures the carbon footprint of transport in that area.
Way to express: number of vehicles getting in and out of in a "cell" per day – size to be defined
Unit: number of vehicles / days
Elements of interpretation: type of vehicles (Type and % of energy used), distances, distance from the coast, coastal versus national.
Link with existing indicator: NA
Source or associated indicator:

Indicator 8 – Pressure of coastal and marine recreation
• Number of rings, mooring and dry-stack storage capacity for recreational boating (innovative)
It measures the intensity of yachting tourism via the associated infrastructures for the activity. Nevertheless, it cannot inform on the level of use and then the associated impacts. It gives an indication on the potential pressure
Way to express: number of storage capacities for yachting in the coastal local administrative units
Unit: NA
Element of interpretation: seasonality, use of energy, water, production of wastes.
Link with existing indicator: NA
Source or associated indicator: port register

Block 3 – Institutional capital

Indicator 9 – Structures (Governance and frames)
• **Existence of dedicated governance structure for ICZM and MSP at national or subnational level (conventional)**
The governance structure is pivotal to ensure adequate implementation of policies and strategies. It is highly dependent on the national organization and the share of competences. It is important to engage stakeholders in the decision-making process. Therefore, the effective structures for ICZM or MSP definition and implementation are to be considered for the sustainable development of the coastal and marine zones.
Way to express: number of existing committee(s) for Blue Economy and/or ICZM with the scale of implementation (local, regional, national)
Unit: NA

Elements of interpretation: scale (national/local), effectiveness.
Link with existing indicator: NA
Source or associated indicator: national administration (including ICZM protocol national reporting reports)
• **Surface of protected areas in waters under national jurisdiction or on the coast (conventional)**
It includes the areas which are covered by a coastal use plan that includes biodiversity issues on the land and the sea with dedicated measures for their protection (and restoration)
Way to express: Surface of protected areas
Link with existing indicator: MPA coverage (cf. https://www.protectedplanet.net/en/thematic-areas/marine-protected-areas)
Unit: %
Element of interpretation: effectiveness, legal status of protection (local, national, Mediterranean, international), date, main constitutive elements of conservation.
Source or associated indicator: national CBD report or national UNEP/MAP reports and RAC/SPA

Indicator 12 – Financing coastal protection and adaptation
• **Financing risk reduction investment projects (innovative)**
It provides a concrete measure of the political will to implement public policies to reduce risks on coastal zones in an effective and efficient manner. It therefore reflects the level of effective commitment of public authorities to transform strategies and action plans into actions implemented with appropriate funding.
Way to express: Budget dedicated to adaptation measures
Unit: % of sub or national budget
Element of interpretation: Coastal *versus* national
Link with existing indicator: NA
Source or associated indicator: Local and national administration
• **Financing protective measures (conventional)**
It provides a concrete measure of the political will to implement public policies to protect coastal zones in an effective and efficient manner. It therefore reflects the level of effective commitment of public authorities to transform strategies and action plans into actions implemented with appropriate funding.
Way to express: Budget dedicated to protective measures
Unit: % of national budget
Link with existing indicator: NA
Source or associated indicator: Local and national administration

The assessment of the proposed indicators on the basis of the RACER weighting is presented in the following Table 3.

Table 3. Assessment of the level of relevance of the proposed indicators

	Indicators	Relevant	Accepted	Credible	Easy	Robust	Total
First priority list	**Indicator 1 – Demand of property at the coast**						
	Measurement of size, density of the population living in the coastal zone	4	4	4	4	4	**20**
	Indicator 2 – use for industrial land						
	Percentage of industrial lands on the coastal zones (established)	3	4	4	4	3	**18**
	Area converted from the non-converted to developed land use	3	4	4	4	3	**18**
	Indicator 3 – Area of built-up land						
	Percentage of built-up land by distance from the coastline	4	4	4	4	4	**20**
	Percentage of length of the coastline urbanized	4	4	4	4	4	**20**
	Indicator 4 - Coastal erosion						
	Proportion of the coastline affected by coastal erosion	4	4	4	4	4	**20**
	Indicator 5 - Allocated space for maritime infrastructure	4	4	4	4	4	**20**
	Level of permanent occupation of the sea for maritime activities	3	4	4	4	4	**19**
	Indicator 10 - Percentage of environmental taxes collected	**4**	**4**	**4**	**4**	**4**	**20**
	Indicator 11 - Application level of environmental legislation						
	Existence of related Plans/frames	2	4	4	4	4	**18**
	Percentage of the marine zones covered by MSP legal tools	3	3	4	4	3	**17**
Second priority list	**Indicator 6 - Land take by intensive agriculture**						
	Percentage of agricultural land farmed intensively	2	3	3	2	4	14
	Indicator 7- Demand for road travel at the coast						
	Volume of traffic on the motorways and major roads	2	2	2	1	4	11
	Indicator 8 - Pressure of coastal and marine recreation						
	Number of rings, mooring and dry-stack storage capacity for recreational boating	3	3	2	2	4	14
	Indicator 9 - Structures (Governance and frames)						
	Existence of dedicated governance structure for ICZM and MSP at national or subnational level	3	4	4	4	3	**18**
	Surface of protected areas in waters under national jurisdiction or on the coast	3	4	4	4	3	**18**
	Indicator 12 - Financing coastal protection and adaptation						
	Financing risk reduction investment projects	3	4	4	3	3	**17**
	Financing protective measures	3	4	3	3	3	**16**

On the basis of the assessment of the level of relevance of the proposed criteria based on the weighting presented above 15 criteria have a score above 80% (over 16/20) and 4 are in total agreement (100%) (cf. Table 4). All the criteria in the first priority list have a score at least equal to 16/20. In the light of this rapid assessment, it is possible to select from these 18 indicators a set of indicators to monitor and evaluate the governance of Mediterranean coastal areas.

1- Measurement of size, density of the population living in the coastal zone
2- A- Percentage of industrial lands on the coastal zones (established)
   B- Area converted from the non-converted to developed land use
3- A- Percentage of built-up land by distance from the coastline
   B- Percentage of length of the coastline urbanized
4- Proportion of the coastline affected by coastal erosion
5- Level of permanent occupation of the sea for maritime activities
6- Land take by intensive agriculture
7- Demand for road travel at the coast
8- Number of berths, mooring and dry-stack storage capacity for recreational boating
9- A-Existence of related Plans/frames
   B- Surface of protected areas in waters under jurisdiction or on the coast
   C- Percentage of the marine zone covered by MSP legal tools
   D- Existence of dedicated governance structure for ICZM and MSP at national or subnational level
10- Percentage of environmental taxes collected (innovative)
11- Application level of environmental legislation
12- A-Financing risk reduction investment projects
   B- Financing protective measures

Conclusions and next steps

The proposed set of indicators should not be considered in an isolated manner but should be conducted as part of an integrated observation and monitoring and possibly early warning system. This mechanism should also address the human and functional capacities in the countries to implement a system of observation and monitoring of indicators. The selection of the indicators was driven in a Science-Policy Interface (SPI) perspective, thanks to a scientific review, a validation with a community of experts before and during a dedicated workshop in order ensure their relevance (RACER) for the endorsement by decision makers with regards to the implementation of IMAP in the Mediterranean. Science–policy interfaces are avenues for finding solutions for environmental challenges through strengthening collaborations between research disciplines and public administrations (Lopez-Rodrigez et al., 2015). SPI are relevant "spaces" to connect scientists, policy makers and other data providers to communicate, exchange and jointly develop knowledge by using common indicators. This approach may enrich policy and decision-making policy and decision-making processes, and/or research (Young et al. research (Young et al., 2013). SPI can be formal structures, such as the Intergovernmental Panel on Climate Intergovernmental Panel on Climate Change (IPCC), or the Intergovernmental Science and Policy Platform and Policy Platform on Biodiversity and Ecosystem Services (IPBES). Many SPI's are, however, less formal structures (Plan Bleu, 2021).

The Table 4 below presents the link with the EO, SDG and MSSD and the proposed indicators.

Table 4. Link with the EO, SDG and MSSD and the proposed indicators

Relation with the Maritime and coastal capital	Indicator title	Status	Associated Environmental objective	Link with SDG (related SDG's indicators)
Natural capital (marine and coastal space)	Measurement of size, density of the population living in the coastal zone	C	Descriptor 7	11.3.1,15.3.1.
	Percentage of industrial lands on the coastal zones (established)	C		
	Area converted from the non-converted to developed land use (innovative)	I		14.3.2
	Percentage of length of the coastline urbanized	C	Descriptor 1, 7	12.2.1
	Percentage of built-up land by distance from the coastline	C		12.2.1
	Proportion of the coastline affected by coastal erosion Percentage of length of the coastline urbanized	I	Descriptors 1. 6. 7	11.5.3.12.2.1; 12.2.1; 13.1.2; 14.3.3
	Level of permanent occupation of the sea for maritime activities	I	Descriptors 1. 6. 7	14.4.1; 12.2.1
	Proportion of agricultural land farmed intensively	I	Descriptors 1. 3. 5	14.1.1 a); 15.1.2
Technical capital (Infrastructures and services)	Volume of traffic on the motorways and major roads	I	Descriptor 7	12.2.1
	Number of berths, mooring and dry-stack storage capacity for recreational boating	I	Descriptors 1. 2. 5. 10.	12.2.1; 12.b.1 13.1.3
Institutional capital	Percentage of environmental taxes collected	I	Descriptor 1 to 11	12.5.1; 12.4.2 b) ; 12.2.1
	Existence of dedicated governance structure for ICZM and MSP at national or subnational level	C	Descriptor 1 to 11	13.3.1. ; 14.b.1; 15. a.1.
	Surface of protected areas in waters under jurisdiction or on the coast	C		14.4.1; 14.5.1; 14.6.1
	Existence of related Plans/frames	C	Descriptor 1 to 11	13.3.1. ; 14.b.1; 15. a.1.

	Percentage of the marine zone covered by MSP legal tools	C	Descriptor 1 to 11	13.3.1. ; 14.b.1; 15. a.1.
	Number of non-applications of environmental legislation	I	Descriptor 1 to 11	13.1.2; 14.2.1; 12.2.1
	Financing coastal protection and adaptation	I	Descriptor 1 to 11	13.a.1; 13.1.3; 13.1.2; 17.1.2; 17.7.1

In order to test the proposed set of indicators, different countries have been suggested such as the Mediterranean Moroccan coastal zone, Bosnia & Herzegovina and Egypt.

These pilot cases could be selected to verify the possibility of use of these indicators, to check the level of relevance of the selected scale(s) and to identify the institutional and/or non-institutional entities that would be involved/responsible for populating the proposed indicators.

Two possibilities can be considered for testing the proposed indicators at either national or local level.

	National	**Local or sub-national**
PROS	● Whole picture ● Link with national SDG's ● Comparable at regional level	● Requires a short time ● Links with "local" SDG's ● comparable at local and subregional levels of the same country and other Mediterranean countries ● More manageable
CONS	● Financially costly ● Time consuming ● Involves number of actors and representatives	● Partial picture ● May require local expertise