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Meeting of the Correspondence Group on GES and Targets
Coast and Hydrography Cluster

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Approaches for definition of Good Environmental Status (GES) and setting targets for the Ecological Objective (EO) 7 "Hydrography" and EO8 "Coastal ecosystems and landscape" in the framework of the Ecosystem Approach

Delegates are kindly requested to bring their documents to the meeting

UNEP/MAP
Athens, 2013

1. Introduction

During their ordinary meeting held in Paris in February 2012, the Contracting Parties to the Barcelona Convention adopted 11 Mediterranean Ecological Objectives (EOs) associated with Operational Objectives and Indicators as part of Decision 20/4 (Implementing MAP ecosystem approach roadmap: Mediterranean Ecological and Operational Objectives, Indicators and Timetable for implementing the ecosystem approach roadmap). They also requested the Secretariat to work on the determination, for each EO, of Mediterranean Good Environmental Status (GES) and targets during the biennium 2012-2013, through a participatory process involving MAP components, Contracting Parties and scientific community with the view of submitting the proposed Mediterranean GES and targets to the next meeting of the Contracting Parties.

This working document aims at proposing approaches for the determination of GES for Ecological Objective 7 (Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems) and Ecological Objective 8 (The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved). It also aims at proposing targets for these two EOs.

Given the complexity of hydrographic conditions, coastal ecosystems, and in particular coastal landscapes and coastal erosion, a wide consultation among specialists is required. This document should be considered as a first contribution from the Secretariat to facilitate the works of the Coastal and Hydrological Conditions Cluster of the EcAp Correspondence Group on GES and targets. Nevertheless, the proposed approaches for GES and targets determination need to be reviewed by the cluster experts and where necessary adapted and/or reoriented to take into account the specificities of each component of the Mediterranean coastal ecosystem as well as the specific conditions prevailing in the Mediterranean sub-regions or countries.

2. Definitions

The purpose of the following definitions is to allow a common understanding of the key terms used in this document. They will be reviewed and amended and where necessary revised by the Coastal and Hydrological Conditions Cluster of GES and Targets Correspondence Group.

Ecological Objective (EO) is a very generic term but, in essence, specifying an EO means providing a set of clear environmental indicators leading towards certain desired ecological/environmental quality.

Good Environmental Status (GES) refers to the desired status of the marine and coastal environment and its components. It involves protecting the marine and coastal environment, preventing its deterioration and restoring it where practical, while using marine and coastal resources sustainably. The determination of GES in the Mediterranean is based on the 11 Ecological Objectives adopted by the Contracting Parties. Considering that the Mediterranean coastal ecosystems are providing services in support to diverse human activities, GES should not refer to a pristine state, as that would be an idealistic objective almost impossible to reach. Instead, it should relate to a state that accommodates the use of the marine and coastal environment with a high level of resilience of the ecosystems to the impacts of human activities and of predicted Global Changes.

GES Threshold defines, for a specific Ecological Objective indicator, the limit beyond which the related Operational Objective cannot contribute to achievement of the desired Good Environmental Status.

GES Target is a "qualitative or quantitative statement on the desired condition of the different components of, and pressures and impacts on, marine water (and coastal ecosystem)..." (MSFD). It also relates to an objective indicator corresponding to the required conditions for maintaining or reaching the desired Good Environmental Status.

GES Baseline represents the reference conditions against which current and future state is compared. Reference conditions describe a known state of the marine and coastal environment but it may not necessarily reflect “background” or “historical” conditions and it is up to the regulator to decide a specified level of disturbance from the pressure(s) and hence to define the boundary between an acceptable state (GES) and an unacceptable state (non-GES).

3. Spatial (geographical) and temporal scales

Spatial and temporal scales are among the most important aspects of the definition of GES. In the case of coastal ecosystems, the parameters and processes important at one scale are frequently not important or predictive at another scale, and information is often lost as spatial data are considered at coarser scales of resolution.Thus, for example, shoreline changes induced by erosion and accretion are natural processes that take place over a range of time and spatial scales. They may occur in response to smaller-scale and shorter-term events, such as storms, regular wave action, tides and winds, or in response to larger-scale and longer-term events such as glaciation or orogenic cycles that may significantly alter sea levels (rise/fall) and tectonic activities that cause coastal land subsidence or emergence. Changes in the landscape may not be so temporally dynamic as with the coastal erosion, but spatially they may be quite diverse. They may be as large as thousands of square kilometers or as small as tens of square meters if landscapes are defined according to organisms or eco- logical processes under consideration.

For the Mediterranean, the EcAp Coordination Group recommended that scales, in principle, should be national and when possible regional (Mediterranean) and transboundary or sub-regional. GES would normally be defined at a higher scale (Mediterranean or sub-regional) than the targets (which will be defined at national or sub-national level).The temporal scale of the assessment will be harmonised with review cycle for the integrated assessment of ecosystem approach roadmap. At their 17th Ordinary Meeting (Paris, February 2012) the Contracting Parties adopted the establishment of a review cycle on a 6 year basis.

4. Proposed approach for GES determination and GES targets

4.1. Ecological Objective 7 – Hydrographic Conditions

The Ecological Objective 7 states as follows:

"Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems ".

Hydrographic parameters, and respectively targets, need to consider the individual circumstances in a location, i.e. changes can only be compared against a baseline but mostly not against general standards. Respectively the term “Good Environmental Status” (GES) has been introduced, defining a healthy status of ambient conditions, i.e. seabed morphology

and sediment budget according to natural conditions. Baseline survey information as well as relative comparisons to similar sites have to be used to define the threshold between "healthy" and "unhealthy" conditions. The current state and conditions can then be compared against "good" conditions and the status defined.

It is important to understand that the reference conditions describe the state of the respective environment in which there is considered to be no, or very minor, disturbance from the pressures of human activities (i.e. "healthy" conditions). Reference conditions may not necessarily reflect "historical" conditions and it is up to the regulator to decide whether Good Environmental Status will represent pristine or slightly impacted but still "good" status, allowing for a specified level of disturbance from the pressure(s) and hence to define the boundary between an acceptable state (GES) and an unacceptable state (non-GES).

A constraint in defining both the current as well as healthy state of the environment is often data availability which may be insufficient to detect disturbances that currently occur and that may also be insufficient in the representation of the previous undisturbed conditions. While the former can be tackled through improved monitoring efforts, the latter is a gap that cannot be closed as easily.

Operational objectives and indicators

The operational objectives and indicators adopted by the Contracting Parties for EO7 are presented in the table below. The table is extracted from the Decision 20/4 of the 17th Contracting Parties Meeting in Paris in 2012.

Ecological Objective	**Operational Objectives**	**Indicators**
Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems.	**7.1 Impacts to the marine and coastal ecosystem induced by climate variability and/or climate change are minimized**	7.1.1 Large scale changes in circulation patterns, temperature, pH, and salinity distribution
		7.1.2 Long term changes in sea level
	7.2 Alterations due to permanent constructions on the coast and watersheds, marine installations and seafloor anchored structures are minimized	7.2.1. Impact on the circulation caused by the presence of structures
		7.2.2 Location and extent of the habitats impacted directly by the alterations and/or the circulation changes induced by them: footprints of impacting structures
		7.2.3 Trends in sediment delivery, especially in major deltaic systems
		7.2.4 Extent of area affected by coastal erosion due to sediment supply alterations
	7.3 Impacts of alterations due to changes in freshwater flow from watersheds, seawater inundation and coastal freatic intrusion, brine input from	7.3.1. Trends in fresh water/sea water volume delivered to salt marshes, lagoons, estuaries, and deltas; desalination brines in the coastal zone

	desalination plants and seawater intake and outlet are minimized	7.3.2. Location and extent of the habitats impacted by changes in the circulation and the salinity induced by the alterations
		7.3.3 Changes in key species distribution due to the effects of seawater intake and outlet

Proposed GES description and targets for EO7

General targets for Good Environmental Status of the Mediterranean are defined in a variety of documents, e.g. EC Directives, relevant documentation from the European Environment Agency or specifically the Barcelona Convention. Targets identified in the ICZM Protocol of the Barcelona Convention, adopted in 2008 and entered into force in 2011, are of particular importance with regards to hydrography aspects in the Mediterranean. The targets specified in the protocol (broadly covering what is also included in other documents) are on a general level and have to be taken up by specific programs and legislations.

Recommendations for specifying targets and definition for Good Environmental Status (GES) linked to the hydrography objective (EO 7) have been listed below. The recommendations are based on the general targets set out in the above mentioned documents.

It should be noted that “Hydrography” as used in this report refers so the topographic features of the seafloor (similar to geography), i.e. referring to their state and morphology including fulfilling their natural function.

The GES and targets proposed in the following table should be read with the annotations and remarks explained below:

(*1) Marine and shore based construction as well as land based activities (industry/agriculture) need to be considered in this regard. Planning is necessary in order not to affect coastal and marine morphology. Building and management codes need to be designed to minimize impacts and include mitigation aspects

(*2) Numerical modeling of the coastal wave- and current pattern may need to be applied to understand currents and related sediment movement aspects

(*3) Different rivers carry different sediment loads which have resulted in specific coastal features, i.e. deltas where high sediment loads are natural (e.g. the Nile Delta) or estuaries where natural sediment loads are low. Anthropogenic activities in the catchments have often altered the hydrology of rivers leading to changing sediment budgets. E.g. the construction of the Aswan Dam on the Nile has lead to a strong decrease in sediment load, resulting in a negative sediment budget for the delta, respectively leading to erosion. On the other hand, agricultural activity has lead to increased land erosion on a variety of rivers leading to increased sediment discharges and accretion in estuaries.

(*4) Land based erosion has different aspects in the coastal environment. Increased erosion is mainly attributed to upstream land degradation due to unsuitable agricultural practices, leading to unwanted silt influx and deposition, coverage of habitats, etc. On the other hand sedimentation is also necessary for delta building and a stable delta outline.

(*5) Sediment influx from rivers is altered by reservoirs which lead to sediment deposition. Some sediment flux can be maintained through respective reservoir planning and management

(*6) Erosion and deposition are natural phenomena that occur on the Mediterranean coastline. Sediment budgets are naturally stable between areas that are prone to erosion and other areas that are affected by deposition. Both erosion and deposition are largely affected by current patterns and wave action. The objective would be to maintain natural conditions as far as anthropogenic interests are not affected. As the latter is most often the case (i.e. through harbour dredging or coastline stabilization purposes), respective measures need to be taken to allow for a semi-natural erosion and sedimentation pattern and respective sediment transport

(*7) The assessments should cover an analysis of the current situation as well as the modelling of potential alteration scenarios with the aim to develop a coastal engineering approach that is as close as possible to the natural conditions while serving anthropogenic needs

(*8) Seafloor integrity is normally improved by plant communities, mainly seagrass beds that reduce current velocities and erosion. Respectively seagrass beds are important features for stabilizing coastal morphology. Seagrass cover is maintained through avoiding physical damage (ship and anchor damage) as well as degradation through sediment coverage and water quality deterioration

Operational Objective 7.1.

Operational objective	**Indicator**	**Proposed Good Environmental Status description**	**Proposed Targets**
7.1 Impacts to the marine and coastal ecosystem induced by climate variability and/or climate change are minimized	7.1.1 Large scale changes in circulation patterns, temperature, pH, and salinity distribution	Ecosystems healthy enough to cope with the expected climate change impacts	Ecosystem health maintained and improved
	7.1.2 Long term changes in sea level		

Operational Objective 7.2.

Operational objective	**Indicator**	**Proposed Good Environmental Status description**	**Proposed Targets**
7.2 Alterations due to permanent constructions on the coast and watersheds, marine installations and seafloor anchored structures are minimized *[1]	7.2.1. Impact on the circulation caused by the presence of structures	With new structures in place, nearshore wave- and current patterns maintain as natural as possible.	Marine and shore based structures planned and implemented to include aspects of maintaining the natural wave- and current pattern *[1]
	7.2.2 Location and extent of the habitats impacted	Negative impacts are minimal with no influence on the	Planning of structures takes into account environmental health

	directly by the alterations and/or the circulation changes induced by them: footprints of impacting structures	larger scale coastal system	of surrounding areas *[2]
	7.2.3 Trends in sediment delivery *(from terrestrial watersheds)*, especially in major deltaic systems *[3]	Stable delta outline, stable water depth and biodiversity not affected by sedimentation	Management of upper river catchments and reservoir operation designed for naturalized sediment inflow from rivers *[4] *[5]
	7.2.4 Extent of area affected by coastal erosion due to sediment supply alterations	Stable sediment budgets with regards to the natural erosion and deposition patterns and processes *[6], partly tailored to anthropogenic needs	Understanding of natural erosion, deposition and sediment movement situation especially at points where changes occur, where coastal assets are threatened and where anthropogenic changes i.e. new coastal structures are planned *[7].

Operational Objective 7.3.

Operational objective	**Indicator**	**Proposed Good Environmental Status description**	**Proposed Targets**
7.3 Impacts of alterations due to changes in freshwater flow from watersheds, seawater inundation and coastal freatic intrusion, brine input from desalination plants and seawater intake and outlet are minimized	7.3.1. Trends in fresh water/sea water volume delivered to salt marshes, lagoons, estuaries, and deltas; desalination brines in the coastal zone	Natural conditions and specifically salinity levels below threshold levels maintained as much as possible	System understanding obtained, regulations for respective environmental impact assessments and mitigation requirements developed
	7.3.2. Location and extent of the habitats impacted by changes in the circulation and the salinity induced by the alterations		

	7.3.3 Changes in key species distribution due to the effects of seawater intake and outlet		

Additional suggestions

Operational objective	**Indicator**	**Proposed Good Environmental Status description**	**Proposed Targets**
Impacts on the seafloor due to use of the coastal area by boating and fishing are minimized	Damage to seafloor, health of benthic biodiversity	Stable and healthy seagrass beds and other benthic communities that fulfil their function of seafloor protection against wave action and respective morphological changes	Sufficiently gazetted protected areas (no ship movement / no anchoring) and seafloor not damaged; Erosion from terrestrial catchments, nutrient, fertilizer, pesticide and pollutant influx to coastal systems low enough to maintain water quality and respective plant communities influencing seafloor integrity *[8]
Improve monitoring situation for rivers, estuaries and coastal areas to understand current situation as well as future developments and detect adverse conditions	The monitoring situation for a variety of hydrography related parameters (currents, waves, water levels, sediment erosion/accretion, seabed cover, etc. are sufficient to obtain a full picture of current conditions and developments	A monitoring network and data management system with good spatiotemporal coverage of the mentioned parameters both terrestrial and in the coastal areas; Thorough understanding of coastal processes	Monitoring and data management for better planning and avoidance of unwanted negative results of developments improved

4.2. Ecological Objective 8 – Coastal Ecosystems and Landscape

The Ecological Objective 8 states as follows:

"The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved".

This objective does not have a precedent in other regional EcAp initiatives, such as Helcom or OSPAR. While their objectives are fully oriented towards marine environment, the Mediterranean countries have opted for a somewhat different approach. While most of the EOs are marine environment oriented, this EO is based on the requirements originating from the geographic coverage of the revised Barcelona Convention and the ICZM Protocol, as well as the LBS Protocol. In all these documents, the spatial coverage extends to the terrestrial part of the coastal zone. The ICZM Protocol best defines such approach through its definition of the coastal zone which says that it is the "...geomorphologic area either side of the seashore in which the interaction between the marine and land parts occurs in the form of complex ecological and resource systems made up of biotic and abiotic components coexisting and interacting with human communities and relevant socio-economic activities." In fact, this definition is very close to the definition of the "coastal ecosystem". Because the coastal ecosystem is such an important element of the regional Mediterranean space, the introduction of this EO is fully justified.

The legal definition of "coastal zone", which states the seaward and landward limits of the coastal zone, is also given in the text of the ICZM Protocol. In the context of EcAp, one could say that it is of less importance, although it emphasizes the integrated nature of the coastal zone, particularly through consideration of marine and terrestrial parts as its constituent elements.

Operational objectives and indicators

The operational objectives and indicators adopted by the Contracting Parties for EO8 are presented in the table below. The table is extracted from the Decision 20/4 of the 17th Contracting Parties Meeting in Paris in 2012.

No legal document of the Barcelona Convention defines two basic notions contained in this EO, notably "natural dynamics" and "coastal landscape". The ELOISE project, for example, uses the term "dynamics" in coastal context to reflect both internal dynamics (changes occurring within a habitat due to internal or external forces, where the habitat itself remains identifiable) as well as profound changes in the nature of a habitat leading to a transition into another type. "Coastal erosion" is the most obvious example of coastal (natural) dynamics. The simplest definition states that it is the gradual wearing away of material from coast by the action of seawater through wave action, tidal currents, or drainage.

The definition of the term "coastal landscape" is more difficult to find. "Landscape" is generally defined as mosaic of “interacting ecosystems”. The term has many components including visual, political, socio-economic and cultural. From that perspective, the broad concept of "landscape", encompasses both natural and cultural elements i.e. the natural landscape is the fabric that integrates settlement, agriculture and ecology. The term coastal landscape implies a relationship between land and sea. Some units in these landscapes such as beaches or rocky islands are defined by both sea and land while others such as mud flats and salt marshes exist somewhere between land and sea. From the above, it results that maintaining and preserving coastal ecosystems and landscapes involves addressing not only the issues related to the geographical settings *per se*, but also the processes influencing the dynamics of these physical settings.

Ecological Objective	Operational Objectives	Indicators
The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved	**8.1 The natural dynamic nature of coastlines is respected and coastal areas are in good condition**	8.1.1. Areal extent of coastal erosion and coastline instability
		8.1.2 Changes in sediment dynamics along the coastline
		8.1.3 Areal extent of sandy areas subject to physical disturbance[1]
		8.1.4 Length of coastline subject to physical disturbance due to the influence of manmade structures
	8.2 Integrity and diversity of coastal ecosystems, landscapes and their geomorphology are preserved	8.2.1 Change of land-use[2]
		8.2.2 Change of landscape types
		8.2.3 Share of non-fragmented coastal habitats

Components to be considered

The complexity of coastal ecosystems (marine and terrestrial) makes very difficult their assessment at all levels and in all areas. For that reason, in the past there has not been systematic monitoring, in particular not quantitatively based monitoring, of changes in coastal ecosystems, as has been the case with some other thematic areas, such as pollution. This fact makes this task even more difficult. Also there has been no major attempt to systematize characteristics of coastal ecosystems on a wider Mediterranean basis. However, the importance of coastal ecosystems, as mentioned earlier, justifies their inclusion in this EcAp initiative. As a starting point, it is important to say that the two operational objectives of this EO (8.1. and 8.2.) refer to several important components of coastal ecosystems that require further attention.

The first operational objective, referring to the "natural dynamics", essentially reduces itself to the issue of **coastal erosion**. Coastal erosion is one of the most important socio-economic problems that challenge the capabilities of states and local authorities. Whether it is due to natural or anthropogenic reasons, coastal erosion causes significant economical losses, social problems, and ecological damages. The problem of erosion may extend its influence hundreds of kilometres alongshore in the case of large deltaic areas, and may have transboundary implications. In the case of pocket beaches on the other hand, it could be a very local phenomenon affecting only the residents of a nearby town and/or the tourism industry. The natural causes of long term coastal erosion are the following: sea level rise, coastal subsidence due to tectonic events, climatic changes, increased vegetation cover over the river watersheds due to climatic changes, sediment sinks, changing of river courses and mouths in deltas. Anthropogenic causes are: decreasing sediment supply by rivers to the coastal physiographic unit, erosion control works and afforestation in coastal and riverine

[1] Physical disturbance includes beach cleaning by mechanical means, sand mining, beach sand noursihment
[2] Land-use classess according to the classification by Eurostat-OCDE, 1998: http://unstats.un.org/unsd/environment/q2004land.pdf

watersheds, decreasing the volume of sand in the physiographic unit, alteration of the usual pattern of coastal currents and the associated sediment transport along and across the shoreline, due to man-made coastal structures and urban development too close to the shoreline, anthropogenic changes made to river courses and mouths in deltas, maintenance dredging of approach channels and estuarine inlets, land subsidence due to anthropogenic effects.

The second operational objective refers to the integrity of coastal ecosystems, which is, essentially, expressed through the issue of **coastal landscapes**. Coastal landscapes are expressions of anthropogenic (cultural) and natural processes in the coastal zone, as well as home to considerable biodiversity wealth. Well preserved coastal landscape is an indicator of good environmental status, but also a basis for sustainable socio-economic development.

The Coastal and Hydrological Conditions Cluster is invited to discuss the proposed approach and to agree on lists of indicators for the assessment of GES in relation to EO8 (Coastal Ecosystem and Landscapes).

Geographic scale

With regards to the geographical scales, both the components of coastal erosion and of coastal landscapes should follow similar approach. While analyses of the situation could take in consideration the entire Mediterranean region (for example, the division of the regional coastlines in eroding, stable, and accruing coasts; or the types of coastal landscapes with regards to their physical characteristics and/or underlining socioeconomic processes), the actual definition of the GES and targets will have to take in consideration the local aspects of each phenomena. Furthermore, if GES is the basis for undertaking management measures, then local and, at best, national scale is the most appropriate. However, it has to be mentioned that in some rare cases, the geographical scale goes beyond national level, up to the subregional ones, such as in the case of southeastern Mediterranean sediment flows. Finally, this issue should be given due consideration by the Coastal and Hydrological Conditions Cluster.

Proposed GES description and targets for EO8

Despite increasing efforts, in particular in the EU countries of the Mediterranean, to study these phenomena, there are still critical gaps in the information and data for many key components. This is particularly relevant for the issue of coastal landscape, because the costal erosion has very direct and, often, very negative impact on coastal development as well as major economic costs, hence the phenomena gets resources more easily to study it. Coastal landscapes and, in general, coastal geomorphology is often the victims of overambitious development decisions. For that reason, the establishment of baselines for both components in the Mediterranean is still very difficult. The tables below present the proposal for the GES and targets for both operational objectives

Operational Objective 8.1.

Operational objective	Indicator	Proposed GES description	Proposed targets
8.1. The natural dynamics nature [proposal: delete **nature**]**of coastline is respected and coastal areas are in good condition**	8.1.1. Aerial extent of coastal erosion and coastal instability	Coastal erosion is the result of predominantly natural factors and caused by natural dynamics Coastal resilience improved and coastal uses made adaptable to coastal erosion	Impacts of coastal erosion caused by man made factors anticipated and prevented Coastal erosion management allows for natural fluctuation of the coast Coastal erosion risk minimised by defining coastal setback
	8.1.2. Changes in sediment dynamics along the coastline	Sediment dynamics is the result of natural processes	Improve Integrated River Basin Management to reduce disturbance in sediment inflows Implement the concept of coastal sediment cell and strategic sediment reservoirs, by utilising MSP
	8.1.3. Aerial extent of sandy areas subject to physical disturbance	Physical disturbance of sandy areas (beaches) minimised	Implement beach nourishment measures
	8.1.4. Length of coastline subject to physical disturbance of manmade structures	Physical disturbance caused by man made structures minimised	Impacts of coastal erosion caused by man made factors anticipated and prevented or minimised

Operational objective 8.2.

Operational Objective	Indicator	Proposed GES description	Proposed targets
8.2. Integrity and diversity of coastal ecosystems, landscapes and their geomorphology preserved	8.2.1. Change of land use	Perpendicular coastal development, with linear development minimised Mixed land-use structure achieved[in coastal spatial units, to be established]	No further construction within 100 m width setback zone; established in majority of countries Change of coastal land use structure, dominance of urban land use reversed Adaptive ccarrying capacity established and implemented
	8.2. 2. Change of landscape types	Coastal landscape becomes strategic element of local identity Different landscape types form a harmonious and balanced whole	Expand network of protected coastal landscapes Limited extent of mono- type coastal landscapes Mixed landscape structure maintained
	8.2.3. Share of non-fragmented coastal habitats	Coastal habitats are not fragmented to a level that prevents them from providing ecological functions and environmental services	Share of non-fragmented coastal habitats higher than [60%] within a coastal landscape unit