

Note by the Secretariat

This document reflects the discussion, conclusions and recommendations of the Third Meeting of Technical Experts on the Application of the Ecosystem Approach held in Istanbul on 10-11 March 2011 regarding a proposal by the Secretariat on the Ecological Objectives, Operational Objectives and Indicators for the application of the Ecosystem Approach in the Mediterranean. The corresponding tables, reproduced in this document, were agreed in Istanbul and included in the Conclusions and Recommendations of the meeting, which are annexed to the meeting report¹.

Shortly after the meeting in Istanbul the final edited version of the Conclusions and Recommendations was distributed electronically to the Parties for final verification and minor comments on the wording of the elements of the tables. The tables corresponding to Ecological Objectives 3 and 4 related to harvest of commercially exploited fish and shellfish and marine food webs were also shared with the General Fisheries Commission of the Mediterranean (GFCM) in order to seek their technical advice and input as instructed by the meeting.

The comments on the content of the tables received from Algeria, France, Israel and Malta together with the comments from the GFCM have been incorporated in two different ways in the present document:

- i) in the text accompanying the tables when these comments were related to further definition or clarification of the terms used in the tables or
- ii) in “track changes mode” including an endnote when they implied the modification of the wording in the tables agreed during the Istanbul meeting so the changes can be clearly identified.

¹ UNEP(DEPI)/MED WG.355/5

Introduction

1. Since the adoption of the roadmap for implementing ecosystem approach along with the vision and strategic goals in January 2008, the work of UNEP/MAP has evolved naturally to undertake a baseline assessment and identify ecological objectives with consideration of associated operational objectives and indicators.

2. The ecological specific objectives should reflect the ecosystem approach vision and goals as well as a basic understanding of ecosystem condition, values, pressures and impacts. They serve as a starting point for regional and sub-regional cooperation and discussions among the Contracting Parties on how to move the EA process forward in a timely manner.

3. The meetings of technical experts held in Rome (8-9 April 2010) and Barcelona (6-7 July 2010) and specially the one recently held in Istanbul (10-11 March 2011) discussed the methodology for the determination of the Ecological Objectives including the corresponding suites of Operational Objectives and Indicators and ultimately reviewed and amended as necessary the initial proposal prepared by the Secretariat according to the agreed methodology.

4. The following Ecological Objectives for the Mediterranean were defined and agreed following a methodology, developed by the Secretariat and approved at the technical meetings, which is in harmony with the EU MSFD Descriptors but tailored for the scale and circumstances of moving towards an ecosystem approach within the Mediterranean region. The resulting Ecological Objectives take into account the geographical scope of the application of the Barcelona Convention and its Protocols, the issues emerging from the finalized Integrated Assessment Report, socio economic considerations, Integrated Coastal Zone Management (ICZM) and cumulative impacts.

1. *Biological diversity is maintained or enhanced. The quality and occurrence of coastal and marine habitats and the distribution and abundance of coastal and marine species are in line with prevailing physiographic, hydrographic, geographic and climatic conditions*
2. *Non-indigenous species introduced by human activities are, to the maximum extent possible, at levels that do not adversely alter the ecosystem*
3. *Populations of select commercially exploited fish and shellfish are within biologically safe limits, exhibiting a population age and size distribution that is indicative of a healthy stock*
4. *Alterations to components of marine food webs caused by resource extraction or human-induced environmental changes do not have adverse effects on food web dynamics and related long term viability*
5. *Human-induced eutrophication is minimized, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algal blooms and oxygen deficiency in bottom waters*
6. *Sea-floor integrity is maintained to the maximum extent possible, especially in key benthic habitats (e.g. coastal lagoons and marshes, intertidal areas, seagrass meadows, coralligenous communities, sea mounts, submarine canyons and slopes, deep-water coral and hydrothermal vents)*

7. *Alteration of hydrographic conditions does not adversely affect marine ecosystems*
8. *The natural dynamics of coastal areas are maintained and natural coastal habitats are not degraded or lost due to human activities*
9. *Contaminants and noise cause no significant impact on the marine ecosystems and human health*
10. *Marine and coastal litter do not adversely affect biodiversity and ecosystem services*

5. A set of Operational Objectives, and their corresponding Indicators, for each of these draft proposed Ecological Objectives was also developed according to the methodology which included consideration to the pertinence of the Operational Objective as it relates to the Ecological Objective, to the feasibility of collecting information across the region, and to the potential importance of the management response that could flow from the adoption of Operational Objectives and Target.

6. This set of Ecological Objectives, Operational Objectives and Indicators will guide the work of the Contracting Parties during the first cycle of the application of the Ecosystem Approach and could be reviewed and amended as necessary towards subsequent cycles. It is important to emphasize here that this inherent cyclical character of the Ecosystem Approach will make possible that, after iterations, the information gathered for the different indicators constitutes trends that will illustrate at what rate ecosystems are approaching thresholds, or moving closer or away from the (later) agreed-upon target levels. Besides the iterative character of the compilation of data for the indicators it is important to mention that the spatial monitoring strategy should be adapted to each of the indicators in order to optimize monitoring efforts.

7. The following sections describe the Ecological Objectives, Operational Objectives and Indicators, as a set, including the rationale followed for their selection and definition.

II. Proposed operational objectives and indicators per ecological objective

2.1 Biodiversity

Ecological Objective	Operational Objectives	Indicators
Biological diversity is maintained or enhanced. The quality and occurrence of <u>terrestrialⁱ</u> coastal and marine habitats and the distribution and abundance of <u>terrestrialⁱⁱ</u> coastal and marine species² are in line with prevailing physiographic, hydrographic, geographic and climatic conditions.	1.1 Species distribution is maintained (<i>in line with prevailing physiographic, hydrographic, geographic and climatic conditions</i>)	1.1.1 <i>Distributional range change</i>
		1.1.2 <i>Area covered by the species (for sessile/benthic species)</i>
	1.2 Population size of selected species is maintained (<i>in line with prevailing physiographic, hydrographic, geographic and climatic conditions</i>)ⁱⁱⁱ	1.2.1 <i>Population abundance</i>
		1.2.2 <i>Population density</i>
	1.3 Key coastal and marine habitats are not being lost (<i>in line with prevailing physiographic, hydrographic, geographic and climatic conditions</i>)	1.3.1 <i>Potential / observed distribution of certain habitats listed under SPA protocol</i>
		[1.3.2 <i>Observed changes to distributional pattern, with threshold rates of loss</i>] ³

8. The purpose of this Ecological Objective is to evaluate whether species and habitat level biodiversity is being maintained, and if it is not, quantifying the rates of biodiversity loss. It should be noted that comprehensive biodiversity monitoring covers also the genetic level of biodiversity, however this is accorded a second order priority status in the EA process due to the complexity of monitoring at the scales of the EA.

9. The species used to assess biodiversity (1.1. and 1.2) will be an agreed-upon subset of those in the list of endangered or threatened species (Annex II) and species for which exploitation is regulated (Annex III) of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean, as well as in the respective regional plans adopted for species in the framework of this Protocol. The distributional range of a species will be given as geo-referenced polygon/s.

10. The information obtained from studying the distributional pattern of a species (1.1.1 and 1.1.2) should be supplemented by information on its population density (1.2.2) and population abundance (1.2.1). The density can be assessed by direct means (i.e. individual counts per surface/volume unit) or by indirect means (i.e. mammal density distribution models). Both size (1.2.1) and density (1.2.2) will be given by reference to the distributional range polygon/s.

² On the basis of Annex II and III of the SPA and Biodiversity Protocol of the Barcelona Convention

³ Further research and knowledge is required for the quantification of this indicator

11. With regard to habitats, a prioritization of habitat types should be done in order to have a realistic starting point. Amongst pelagic habitats upwelling areas, fronts and gyres need special attention and focus.

12. Regarding benthic habitats currently, sufficient information exists to make a prioritization amongst those mentioned in the RAC/SPA list of 27 benthic habitats and the priority habitats in areas beyond national jurisdiction following CBD decisions VIII/24 and VIII/21 paragraph 1⁴. These could include from shallow to deep: biocoenosis of infralittoral algae (facies with vermetids or trottoir), hard beds associated with photophilic algae, meadows of the sea grass *Posidonia oceanica*, hard beds associated with Coralligenous biocenosis and semi dark caves, biocoenosis of shelf-edge detritic bottoms (facies with *Leptometra phalangium*), biocoenosis of deep-sea corals, cold seeps and biocoenosis of bathyal muds (facies with *Isidella elongata*).

13. The habitat distribution (1.3) will be assessed by looking into the potential distributional range by using 2D/3D surrogate mapping techniques or observed distributional range by direct observation (1.3.1). The distributional pattern (1.3.2) needs to be assessed by direct observation as surrogate mapping does not render enough resolution for this purpose. Both indicators will be given, when available, as georeferenced polygons.

14. Recognizing the importance of understanding climate change as both a backdrop against which changes occur and a driver of change, the ultimate choice of indicators relating to the 'prevailing conditions and climate change' should be those that inform of biodiversity status as well as climate change effects, such as warming sea temperatures, sea level rise, changes in pH, etc.

⁴ CBD Technical Series No. 37

2.2 Non-indigenous species

Ecological Objective	Operational Objectives	Indicators
Non-indigenous species introduced by human activities are, to the maximum extent possible, at levels that do not adversely alter the ecosystem	2.1 Non-indigenous species introductions are minimized to the maximum extent possible	2.1.1. <i>Spatial distribution, origin and population status (established vs. vagrant) of non-indigenous species</i> 2.1.2 <i>Trends in the abundance of introduced species, notably in risk areas^{iv}</i>
	2.2. The impact of particularly invasive species on ecosystems is limited	2.2.1 <i>Ecosystem impacts of particularly invasive species</i>

15. The purpose for this Ecological Objective is to evaluate non-indigenous species impacts. This Ecological Objective concentrates on introductions, especially those that can be prevented, recognizing that species composition is the result of ever-changing dynamics in species distribution (as, for example, thermophyllic species move northwards with ocean warming, or as speciation occurs).

16. It is important to define here the meaning of the term non-indigenous which refers to an organism that may survive and subsequently reproduce, outside of its known or consensual range. Non-indigenous may be further characterized as un-established or vagrant, established, invasive and noxious or particularly invasive⁵.

17. Since not all non-indigenous species are particularly invasive (displacing native species or causing other adverse ecosystem impacts), and because many non-indigenous species become established through natural means, the focus is on non-indigenous species introduced as the result of human activities, either accidentally or on purpose, that cause adverse ecosystem impacts and which introduction is potentially preventable. Some non-indigenous species that are not invasive today could become invasive in the future, therefore monitoring of introduced species should be as comprehensive as possible.

18. For Ecological Objective 2, the list of priority (indicator) species introduced by human activities will be derived by consensus, based on information from the CIESM Atlas of Exotic Species in the Mediterranean and the DAISIE project (European Invasive Alien Species Gateway) a database tracking alien terrestrial and marine species in Europe from GFCM.

19. The spatial distribution of introduced species (2.1.1) and particularly invasive species (2.2.1) will be reported as a georeferenced polygon/s. The trends in abundance (2.1.2) will be given by reference to the distributional range polygon/s.

20. The degree of knowledge on the environmental impact of introduced species in the Mediterranean is limited at the moment and it would be difficult to assess for all the species covered in operational objective 2.1. The knowledge gained on this field, especially regarding the economic impact (positive or negative) on fisheries and aquaculture could be integrated progressively.

⁵ Occhipinti-Ambrogi and Galil (2004). Marine Pollution Bulletin 49 (2004) 688–694.
doi:10.1016/j.marpolbul.2004.08.011

2.3 Harvest of commercially exploited fish and shellfish

Ecological Objective	Operational Objectives	Indicators
Populations of selected^v commercially exploited fish and shellfish are within biologically safe limits, exhibiting a population age and size distribution that is indicative of a healthy stock	3.1 Level of pressure by known commercial fisheries is kept within biologically safe limits	3.1.1 <i>Total catch by fishery operational unit^{vi}</i>
		3.1.2 <i>Total effort by fishery operational unit^{vii}</i>
		3.1.3 <i>Catch per unit effort (CPUE) by fishery operational unit^{viii}</i>
		3.1.4 <i>Ratio between catch and biomass index (hereinafter catch/biomass ratio) for selected indicator species, at each trophic level</i>
	3.2 The reproductive capacity of stocks is maintained	3.2.1 <i>Age structure determination (where feasible)</i>
		[3.2.2 <i>Spawning Stock Biomass (SSB)</i>] ⁶

21. The purpose of this Ecological Objective is to evaluate the extent to which key commercial fisheries are sustainable and keeping within maximum sustainable yield limits. Other aspects of fisheries impacts, including directed take and by-catch, on food webs and ecosystem dynamics, as well as benthic impacts of destructive fishing methods, are dealt with by other Ecological Objectives 4 and 6.

22. The choice of indicator species for collecting information for Ecological Objective 3 should be derived from fisheries targeting species listed in Annex III of Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (species whose exploitation is regulated) and the species in the GFCM Priority Species list⁷. Choice of indicators should cover all trophic levels, and if possible, functional groups, using the species listed in Annex III of SPA and/or, as appropriate the stocks covered under regulation (EC) No 199/2008 of 25 February 2008 concerning the establishment of a Community framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy.

23. In order to use indicators that are coherent with the monitoring efforts done by the Parties to report to the GFCM, the use of operational unit instead of fishery for variables like total catch, total effort and catch per unit effort (indicators 3.1.1, 3.1.2 and 3.1.3) is suggested by the Secretariat. Operational unit is the group of fishing vessels practising the same type of fishing operation, targeting the same species or group of species. GFCM has also commented that at present many of these data are unavailable, except for the most important commercial operational units or through direct or indirect assessments limited to a particular research site as they may not be easy to obtain for most landing sites. Further there are some difficulties in the interpretation of the indicators due to the multispecific character of many Operational Units in the Mediterranean. The process of choosing operational unit(s) being investigated for total catch, total effort, and CPUE to inform the Ecosystem Approach should be based on those single species fisheries or GFCM operational units for which data are currently being systematically collected. However, it may be necessary to supplement the ordinary fishery monitoring with targeted monitoring to track

⁶Further research and knowledge is required for the quantification of this indicator

⁷ <http://www.gfcm.org/gfcm/topic/166221/en>

representative changes at each trophic level, both long-lived and fast-turnover species, and habitat-forming species. The choice of target species will have to be made with these considerations in mind, but also with considerations revolving around cost and resources available.

2.4 Marine food webs

Ecological Objective	Operational Objectives	Indicators
Alterations to components of marine food webs caused by resource extraction or human-induced environmental changes do not have adverse effects on food web dynamics and related long term viability	4.1 Ecosystem dynamics across all trophic levels are maintained at levels capable of ensuring long-term abundance of the species and the retention of their full reproductive capacity	<i>4.1.1 Production per unit biomass estimates for selected trophic groups and key species, for use in models predicting energy flows in food webs</i>
	4.2 Normal proportion and abundances of selected species at all trophic levels of the food web are maintained	<i>4.2.1 Proportion of large fish by weight, or other species at the top of food webs</i>
		<i>4.2.2 Trends in proportion or abundance of habitat-defining forming* groups and/or taxa with fast turnover rates</i>

24. The purpose of this Ecological Objective is to track the extent to which resource removal and human-induced environmental changes are affecting food web structure and dynamics. This is in recognition of the interconnected nature of marine ecosystems, the potentially devastating impacts of cascading effects, and the need to steer management in an ecosystem-based direction in order to safeguard important ecosystem services.

25. The choice of operational objectives reflects the ability to use ecosystem science to guide monitoring of food web-wide changes at the scales required for the EA process. Monitoring will have to be coupled to modelling (Marine Trophic Index linked to EcoPath or EcoSim modelling, for example) in order to derive useful information for this important but highly complex set of ecosystem parameters.

26. As for the indicators corresponding to EO4, the GFCM has mentioned the limited availability of data for this suite of indicators due to the need to perform direct or indirect assessments, which normally are limited to very specific areas.

27. The metrics and resolution of data contributed towards the indicators will be agreed beforehand.

2.5 Eutrophication

Ecological Objective	Operational Objectives	Indicators
Human-induced eutrophication is minimized, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algal blooms and oxygen deficiency in bottom waters.	5.1 Human introduction of nutrients in the marine environment is not conducive to eutrophication	5.1.1 Concentration of key nutrients in the water column
		5.1.2 Nutrient ratios (silica, nitrogen and phosphorus), where appropriate
	5.2 Direct effects of nutrient over-enrichment are minimized	5.2.1 Chlorophyll-a concentration in the water column
		5.2.2 Water transparency where relevant
		5.2.3 Number and location of major events of nuisance/toxic algal blooms caused by human activities ^{8x}
	5.3 Indirect effects of nutrient over-enrichment are minimized	5.3.1 Dissolved oxygen near the bottom, i.e. changes due to increased organic matter decomposition, and size of the area concerned ^{*9}

28. The purpose of this Ecological Objective is to ensure that eutrophication does not continue to increase, especially in areas where natural levels of nutrients are relatively low. Adverse impacts of nutrient over-enrichment, including fish kills and the spread of hypoxic or anoxic conditions, are avoided by a tracking and early warning system. In addition, Harmful Algal Blooms are tracked, and the conditions that predispose environments to these blooms are monitored.

29. The choice of operational objectives addresses the human introduction of nutrients as the primary cause for human-induced eutrophication and the direct and indirect ecosystem effects of eutrophication. The suite of indicators (nutrient, chlorophyll, dissolved oxygen concentration, nutrient ratios and water transparency) will be referred to specific water bodies previously identified.

30. The areas in which the information on the indicators should be collected will be determined by the states taking into account previous knowledge on the incidence of eutrophication events. The proposed indicators are in line with UNEP/MAP MEDPOL monitoring programme.

⁸The connexion between eutrophication and toxic algal blooms is subject of devoted research at the moment. The connection between the two is not clearly established as not all the ecosystems react in the same way. In fact recent surveys in UK/Ireland in the framework of OSPAR have allowed concluding on the lack of relation between the them and therefore the number and location of major events of nuisance/toxic algal blooms should always be regarded cautiously as an indicator of a direct effect of nutrient over-enrichment.

⁹Monitoring to be carried out where appropriate

2.6 Sea-floor integrity

Ecological Objective	Operational Objectives	Indicators
Sea-floor integrity is maintained to the maximum extent possible, especially in key benthic habitats (e.g. coastal lagoons and marshes, intertidal areas, seagrass meadows, coralligenous communities, sea mounts, submarine canyons and slopes, deep-water coral and hydrothermal vents)	6.1 Extent of physical damage to the substrate is kept within acceptable limits	<i>6.1.1 Distribution of bottom impacting fishing, dredging activities, seabed mining, marine installations, dumping and anchoring</i>
		<i>6.1.2 Quantification of physical damage due to all activities that cause such physical damage to the substrate.</i>
	6.2 Impact of benthic disturbance in key benthic habitats is minimized	<i>6.2.1 Footprint of activities such as bottom impacting fishing, dredging activities, seabed mining, marine installations, dumping and anchoring in key benthic habitats</i>
		<i>6.2.2 Change in distribution and abundance of indicator species in key habitats¹⁰</i>

31. The purpose of this ecological objective is to address the direct and indirect impacts of activities that disturb the seafloor and its benthic processes. These activities include bottom impacting fishing, dredging for navigation, seabed mining (minerals, sand), submarine cable laying, energy installations and related pipelines (including but not limited to oil rigs and wind turbines), marine constructions such as groins and jetties and anchoring. It is understood that some of these impacts are permanent, while others are periodic – clearly the periodic disturbances will be harder to track and quantify. In addition, there may be reasons that information on the location of certain types of installations (especially those relating to maritime security and national defence, or those related to energy exploration) will be difficult to obtain.

32. The operational objectives would focus on two components: 1) understanding the extent of physical damage to the substrate in space and time, and 2) assessing the impacts of these bottom disturbances on an agreed-to list of priority habitats. These priority benthic habitats will be the same than referred to in Ecological Objective 1 on biodiversity.

33. Habitats not considered in the initial assessment could be added at a later stage to complete a more comprehensive substrate map for the Mediterranean Basin that would constitute a robust baseline, against which the changes in location and timing of bottom-disturbing activities could be compared. Future monitoring could focus on indicators providing further insight on the dynamics and health of benthic habitats.

34. Information on indicator 6.1.1 and 6.1.2 will be provided as a series of polygons by activity type and damage degree.

¹⁰Indicator species to be used to assess the ecosystem effects of physical damage to the benthos could refer to disturbance-sensitive and/or disturbance-tolerant species, as appropriate to the circumstances, in line with methodologies developed to assess the magnitude and duration of ecological effects of benthic disturbance.

2.7 Hydrography

Ecological Objective	Operational Objectives	Indicators
Alteration of hydrographic conditions does not adversely affect marine ecosystems.	7.1 Impacts to the marine and coastal ecosystem induced by climate variability and/or climate change are minimized	<i>7.1.1 Large scale changes in circulation patterns, temperature, pH, and salinity distribution</i>
		<i>7.1.2 Long term changes in sea level</i>
	7.2 Alterations due to permanent constructions on the coast and watersheds, marine installations and seafloor anchored structures are minimized	<i>7.2.1. Impact on the circulation caused by the presence of structures</i>
		<i>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</i>
		<i>7.2.3 Trends in sediment delivery, especially in major deltaic systems</i>
		<i>7.2.4 Extent of area affected by coastal erosion due to sediment supply alterations</i>
	7.3 Impacts of alterations due to changes in freshwater flow from watersheds, brine input from desalinization plants and seawater intake and outlet are minimized	<i>7.3.1. Trends in fresh water volume delivered to salt marshes, lagoons, estuaries, and deltas; desalinisation brines in the coastal zone</i>
<i>7.3.2. Location and extent of the habitats impacted by changes in the circulation and the salinity induced by the alterations</i>		
<i>7.3.3 Changes in key species distribution due to the effects of seawater intake and outlet</i>		

35. The purpose of this Ecological Objective is to understand the impacts that climate change and human activities at sea, on the coast, and in watersheds have on the hydrographic conditions of the Mediterranean. The focus here is on the impact on circulation and water flows that in turn affect productivity and diversity of marine ecosystems and sediment input and dispersion.

36. Information on large-scale circulation will be derived from physical oceanography databases and models while information on local alterations of circulation and water flows will be derived from detailed studies related to human interventions.

37. Information on fresh water input for the northern shore of the Mediterranean will be derived from what European countries are already monitoring under the relevant EU legislation and directives.

38. The criteria and indicators in Ecological Objective 7 have been organized in order to reflect the effect of climate change related changes in circulation and sea level (operational objective 7.1); physical obstruction/modification of water and sediment flows in the marine

environment (operational objective 7.2); and to reflect the effect of alterations in the salinity range due to modifications on the inflow of fresh water due to watershed regulation and/or changes in precipitation regimes and input of brines from desalinization plants (operational objective 7.3).

2.8 Coastal areas

Ecological Objective	Operational Objectives	Indicators
The natural dynamics of coastal areas are maintained and natural coastal habitats are not degraded or lost due to human activities	8.1 The natural dynamic nature of coastlines is respected and coastal areas are in good condition	<i>8.1.1. Areal extent of coastal erosion and coastline instability</i>
		<i>8.1.2 Changes in sediment dynamics along the coastline</i>
	8.2 Loss of natural coastal habitats minimized or reversed through restoration of the integrity of coastal ecosystems^{xi}	<i>8.2.1 Distribution of natural coastal habitats at risk of being lost</i>
		<i>8.2.2 Patterns of land-use change</i>
		<i>8.2.3 Location and scope of restoration measures</i>

39. The purpose of this Ecological Objective is to understand the effect that human activity in the watersheds, on the coast, and at sea has on the coastal sedimentary environment of the Mediterranean. The focus here is on activities that impact sediment delivery and transportation which in turn affect shoreline natural sedimentary dynamics (rates of erosion).

40. The consideration of coastline natural dynamics and intactness of critical coastal land habitats is proposed as a response to emphasis placed by Contracting Parties on regional determinations of the loss of coastal ecosystem services, and the importance of tracking climate change impacts on them. In part this emphasis reflects the unique position that Contracting Parties to the Barcelona Convention and its Protocols are in regarding their ability to truly adopt an ecosystem approach that spans freshwater, coastal lands, and the sea.

41. Information on sediment input from riverine sources will be derived from what countries are to monitor under the Barcelona Convention and its Protocols and relevant EU legislation. There is already a strong link of the proposed operational objectives and indicators with ICZM Protocol requirements.

42. Concerning coastal erosion, there are of course other forces at play that affect coastline natural dynamics, including climate change-induced sea level rise, intensity and periodicity of storms, changes to inland areas (urbanization, concretization, amount of non-porous surfaces, etc.), and removal of sands, including from seabeds, for beach replenishment, or soils for mining. Except for the latter, these drivers of erosion cannot be addressed with an ecosystem approach to management, however they must be monitored because they are the backdrop against which more directly human-induced changes are occurring, and because climate change impacts also affect the human response – i.e. the extent to which investment and measures for adaptation and restoration will be taken. Cross-integration with information on habitat distribution (under Ecological Objective #1) will enable countries to use this Ecological Objective to craft appropriate management.

2.9 Pollution and noise

Ecological Objective	Operational Objectives	Indicators
Contaminants and noise cause no significant impact on the marine ecosystems and human health	9.1 Concentration of priority contaminants is kept within acceptable limits and does not increase	9.1.1 Concentration of key harmful contaminants in biota, sediment or water
	9.2 Effects of released contaminants are minimized	[9.2.1. Level of pollution effects of key contaminants where a cause and effect relationship has been established] ¹¹
	9.3 Magnitude and impact of acute pollution events is minimized	9.3.1 Occurrence, origin (where possible), extent of significant acute pollution events (e.g. slicks from oil, oil products and hazardous substances) and their impact on biota affected by this pollution
	9.4 Levels of known harmful contaminants in major types of seafood do not exceed established standards	9.4.1. Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood
		9.4.2. Frequency that regulatory levels of contaminants are exceeded
	9.5. Water quality in bathing waters and other recreational areas does not undermine human health	9.5.1 Percentage of faecal streptococci concentration measurements within established standards
		9.5.2. Occurrence of Harmful Algal Blooms within bathing and recreational areas
9.6 Energy inputs into the marine environment, especially noise from human activities is minimized	[9.6.1 Proportion of days and geographical distribution where loud, low and mid-frequency impulsive sounds exceed levels that are likely to entail significant impact on marine animals] ¹²	
	[9.6.2 Trends in continuous low frequency sounds with the use of models as appropriate] ¹³	

¹¹Further research and knowledge is required for the quantification of this indicator

¹²Further research and knowledge is required for the quantification of this indicator

¹³Further research and knowledge is required for the quantification of this indicator

43. This Ecological Objective allows us to understand the effects of key contaminants and noise on ecosystem functioning and of harmful contaminants on human health.

44. The subset of contaminants that constitute priority contaminants has already been agreed by Contracting Parties, and MEDPOL is maintaining databases based on national reporting for all or some subset of these pollutants. Monitoring data should be interpreted against the objective described in the operational objective 9.1 through a series of environmental target levels, expressed as concentrations of chemical contaminants. Examples of suitable target levels include the Environmental Quality Standards (EQSs) derived under the WFD 2000/60/EC and the Environmental Assessment Criteria (EACs) as defined within OSPAR for water, sediment and biota.

45. Biological effects (9.2) should be assessed against environmental target levels of response that are indicative of significant harm to the organism concerned

46. To derive meaningful information on contaminants in seafood in order to support regulatory or management interventions, a list of seafood commonly consumed throughout the region must be established. Considerations include the availability of these types of seafood for port sampling and/or market sampling, and the representation of different functional groups (and thus different pathways for ingestion of contaminants and different levels of bioaccumulation).

47. The impact of noise which certainly has the potential to be substantial, particularly as it affects marine mammals, needs to be considered in the overall pollution impacts to ensure that the science around understanding and quantifying noise impacts and publicly available technology for monitoring noise improves to a level that allows the recommendation of management actions alongside with other pollution reduction measures. Of particular concern is the generation of noise-producing activities such as shipping, military use of sonar, and use of air guns and seismic arrays in energy exploration, in sensitive areas, such as those supporting high concentrations of marine mammals.

2.10 Marine litter

Ecological Objective	Operational Objectives	Indicators
Marine and coastal litter do not adversely affect biodiversity and ecosystem services	10.1 The impacts related to properties and quantities of marine litter in the marine and coastal environment are minimized	<i>10.1.1 Trends in the amount of litter washed ashore and/or deposited on coastlines, including analysis of its composition, spatial distribution and, where possible, source</i>
		<i>[10.1.2 Trends in amounts of litter in the water column, including microplastics, and on the seafloor]¹⁴</i>
	10.2 Impacts of litter on marine life are controlled to the maximum extent practicable	<i>[10.2.1 Trends in the amount of litter ingested by or entangling marine organisms, especially mammals, marine birds and turtles]¹⁵</i>

48. This ecological objective focuses on the impact of marine litter at bathing beaches and other recreational areas. Many countries are already collecting information on the nature of and magnitude of marine litter, and studies have been done on impact of various kinds of litter on ecosystems and biodiversity. Many major recreational areas and beaches are being monitored for this sort of contamination, and information on beach closures is readily available. Within UNEP/MAP a draft strategy on litter is under finalisation.

49. The ability to monitoring marine environments for micro-plastics, or to be able to systematically evaluate the ecosystem impacts of litter (especially out at sea) is very limited at this point in time, especially at the scale that the EA process requires. As the science matures and as technology advances to the point to providing effective and efficient means of tracking these parameters and effects, additional operational objectives and indicators could be adopted.

50. The effects of marine litter on marine life are also focus of this ecological objective as the impacts on large marine fauna are increasing constantly.

¹⁴Further research and knowledge is required for the quantification of this indicator

¹⁵Further research and knowledge is required for the quantification of this indicator

Endnotes

- ⁱ After the comment received by one Contracting Party the Secretariat suggests to add “terrestrial” for clarity and ensure coherence between the English and French version of this Ecological Objective. For the French version the translation of “coastal species” or “coastal habitats” as merely "espèces côtières" or "habitats côtiers" could be understood as the species and habitats of the coastal marine fringe. Therefore the addition of “terrestrial” / “terrestre” is suggested for both the English / French version.
- ⁱⁱ Idem as in endnote i)
- ⁱⁱⁱ After the comment received by one Contracting Party it is suggested to add “(in line with prevailing physiographic, hydrographic, geographic and climatic conditions)” for coherence with Operational Objectives 1.1 and 1.3.
- ^{iv} In order to address a comment received by one contracting party on the exact significance of “risk areas” we suggest removing the mention to risk areas. This term was not defined prior or during the Technical Expert Meeting and therefore we suggest to leave the prioritization of the areas where monitoring would be conducted for a later stage as for other indicators.
- ^v Following the clarification by one Contracting Party the term “select” should be replaced by “selected” if the intended meaning of the term is to imply that a selection of species would be used for this Ecological Objectives. The term “select” would imply that the “best” species are used for the assessment of this Ecological Objective.
- ^{vi} The GFCM uses operational units instead of fishery as explained and defined in the accompanying text. The use of operational units is suggested.
- ^{vii} Idem as in endnote v)
- ^{viii} Idem as in endnote v)
- ^{ix} One contracting party pointed out that the correct term is “habitat-defining” and not “habitat forming”. The Secretariat suggests that the precision is taken into consideration.
- ^x Following the discussion already held during the Meeting of Technical Experts on the lack of systematic evidences to connect eutrophication and harmful algal blooms one Contracting Party suggested the need to make mention of this in a footnote. The Secretariat suggests the insertion of the present footnote..
- ^{xi} One contracting party referred to the need to remove the mention of restoration measures in order to be coherent with the approach chosen during the Meeting of Technical Experts to remove any reference to management measures in the Ecological Objectives or Operational Objectives. The Secretariat suggests the deletion of the reference to restoration.