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Agenda item 3: Development of Regional Plans under Article 15 of the Land-Based Sources Protocol of the Barcelona Convention

Agenda item 4: Main Elements of the Six Pollution Reduction Regional Plans

Gap Analysis on existing measures under the Barcelona Convention relevant to achieving or maintaining Good Environmental Status of the Mediterranean Sea

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6th Meeting of the Ecosystem Approach Coordination Group

Athens, Greece, 11 September 2017

Agenda item 2. Midterm Review of the Implementation of the Ecosystem Approach Roadmap

Gap Analysis on existing measures under the Barcelona Convention relevant to achieving or maintaining good environmental status of the Mediterranean Sea

This document was prepared in collaboration with the EU-funded ActionMed Project

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List of Abbreviations/Acronyms

ACCOBAMS	Agreement on the Conservation of Cetaceans in the Black Sea Mediterranean Sea and Contiguous Atlantic Area
ALDFG	Abandoned, lost or otherwise discarded fishing gear
BATs	Best Available Techniques
BEPs	Best Environmental Practices
BOD	Biochemical Oxygen Demand
BWC	Ballast Water Convention
BWM	Ballast Water Management
CAMP	Coastal Area Management Programme
CAP	Common Agricultural Policy
CIS	Common Implementation Strategy
COP	Conference of Parties
EcAp	Ecosystem Approach
EIA	Environmental Impact Assessment
ELV	Emission Limit Value
ELV	Emission Limit Value
EMS	Environmental Management System
ENP	European Neighbourhood Policy
FAO	Food and Agriculture Organization
FRA	fisheries restricted areas
GES	Good Environmental Status
GFCM	General Fisheries Commission for the Mediterranean
HCB	Hexachlorobenzene
HELCOM	Baltic Marine Environment Protection Commission - Helsinki Commission
HNV	High Nature Value (farming)
IAS	Invasive Alien Species
ICC	International Coastal Cleanup
ICZM	Integrated Coastal Zone Management
ILUC	Indirect Land Use Change
IMAP	Integrated Monitoring and Assessment Programme
IMO	International Maritime Organisation
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
IUU Fishing	Illegal, Unreported, and Unregulated Fishing
LBS	Land-based sources
MLRP	Regional Plan on Marine Litter Management in the Mediterranean
MMP	Multiannual Management Plans
MoU	Memorandum of Understanding
MPA	Marine Protected Areas
MSCG	Marine Strategy Coordination Group
MSFD	Marine Strategy Framework Directive
MSP	Maritime Spatial Planning
MSSD	Mediterranean Strategy on Sustainable Development
MSY	Maximum Sustainable Yield
MTA	multi-trophic aquaculture
NAP	National Action Plans
NIS	Non-indigenous species
PAHs	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PCCP	Personal Care and Cosmetic Products
PoM	Programmes of Measures
POP	Persistent Organic Pollutants

PRTR	Pollutant release and transfer register
RBMP	River Basin Management Plan
RFMO	Regional Fisheries Management Organization
ROV	Remotely Operated Vehicles
SAP/BIO	Strategic Action Plan for the conservation of marine and coastal biodiversity in the Mediterranean
SAP/MED	Strategic Action Programme to Address Pollution from Land-Based Activities
SCP	Sustainable Consumption and Production
SDG	Sustainable Development Goal
SEA	Strategic Environmental Assessment
SoER-MED	State of the Mediterranean Marine and Coastal Environment
SPA	Specially Protected Areas
SPAMI	Specially Protected Areas of Mediterranean Importance
SPA/RAC	Regional Activity Centre for Specially Protected Areas
UAS	unmanned aircraft systems
UN Environment	United Nations Environment
UN Environment/ MAP	United Nations Environment– Mediterranean Action Plan
UWWTD	Urban Waste Water Treatment Directive
WFD	Water Framework Directive
WWTP	Wastewater Treatment Plant

I. Introduction and context

1. The Mediterranean Sea

1. The Mediterranean Sea is unique both in terms of ecological and geographical characteristics and in terms of its importance for the socioeconomic development of the region. The Mediterranean marine and coastal ecosystems support a very rich biodiversity in species and habitats, providing a wide range of ecosystem services, including provisioning, regulating, supporting and cultural services[1].

2. The human population of the Mediterranean region, of which more than one third live in coastal areas, relies largely on the ecosystem services provided by the Mediterranean Sea and coast, since fisheries, aquaculture, tourism, marine transport, and the offshore industry are five key economic sectors in the Mediterranean basin, generating 360 billion euros in terms of production value and over four million direct jobs[2] [3]. Those activities however, require a healthy, and productive environment in order to continue developing. Unfortunately, the high number of human activities in the Mediterranean region and especially the fact that usually different activities coexist in the same area without adequate spatial planning and management, can cause cumulative impacts that affect the marine environment. The most important human-induced impacts on the Mediterranean marine and coastal environment, as identified by the Second State of the Mediterranean Marine and Coastal Environment Report (SoER-MED[4]), include coastal degradation and sprawl, chemical contamination, eutrophication, marine litter, marine noise, invasive non-indigenous species, overexploitation of fish stocks, deterioration of sea floor integrity, changes in hydrographic conditions and pressures on biodiversity. The main drivers for the aforementioned impacts are among others the mass unsustainable tourism, industrial activities, fisheries and aquaculture, agriculture, poor waste management and maritime and offshore activities, while all the pressures are amplified by the impacts of climate change.

3. Similarly, the MAP Mid-term Strategy 2016-2021, adopted by COP19 (Decision IG.22/1) identifies the following major environmental issues:

- Coastal development and urban sprawl;
- Chemical contamination of sediments and biota;
- Eutrophication (mostly of local concern);
- Marine litter, concentrated mostly in bays and shallow waters;
- Over-exploitation of coastal and marine resources beyond sustainable limits;
- Sea-floor integrity affected mainly by bottom fishing, but also by dredging and offshore installations;
- Invasive non-indigenous species;
- The impact of marine noise on biota, especially on marine mammals;
- Changed hydrographic conditions caused by local disruption of circulation patterns, due to humans-made structures;
- Marine food webs affected by fisheries pressures;
- Unsustainable patterns of consumption and production as upstream drivers of the above mentioned pressures and impacts on marine and coastal ecosystems;
- Pressures on biodiversity;
- Climate change impact.

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[1] Millennium Ecosystem Assessment, 2005. Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC

[2] UNEP/MAP, 2015. Draft Ecosystem Approach based Measures Gap Analysis. UNEP(DEPI)/MED WG.420/5

[3] The Socio-Economic Report did not access agriculture and specific industry impacts, but focused on the key sectors that take place on the shore or in the sea.

[4] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012

2. UN Environment /Mediterranean Action Plan (MAP) – Barcelona Convention

4. In order to respond to the pressures in the region, and more specifically pollution, 16 Mediterranean States together with the European Community adopted in 1975 the Mediterranean Action Plan, making the Mediterranean the first Regional Sea to adopt an Action Plan under the auspices of UN Environment. A year later, the Convention for the Protection of the Mediterranean Sea Against Pollution, was adopted, serving as the legal basis for international cooperation in environmental protection. In 1995, under the need to enlarge the scope of the MAP system, the new Plan was adopted (MAP Phase II) and the Contracting Parties adopted the "Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean and its Protocols" which entered into force in 2004, replacing the 1976 Convention. In the framework of the Barcelona Convention, seven Protocols have been adopted, covering different aspects of marine environmental protection: Dumping Protocol, Prevention and Emergency Protocol, LBS Protocol, SPA & Biodiversity Protocol, Offshore Protocol, Hazardous Wastes Protocol, ICZM Protocol. The regional legal and policy framework under the Barcelona Convention is complemented by two Strategic Action Programmes, aiming at addressing pollution from land-based activities and protecting the biodiversity in the Mediterranean region (SAP/MED and SAP/BIO), the MAP Mid-term Strategy 2016-2021 and the updated Mediterranean Strategy on Sustainable Development (MSSD) both adopted by COP 19 (Decisions IG.22/1 and IG.22/2), as well as a series of Regional Plans on pollution, biodiversity, Integrated Coastal Zone Management (ICZM), Sustainable Consumption and Production (SCP) etc.

5. The ecosystem approach (EcAp) is the overarching principle of MAP – Barcelona Convention with the ultimate aim of defining and achieving GES in the Mediterranean Sea and coasts. The Contracting Parties to the Barcelona Convention adopted in COP15 (Almeria, Spain, January 2008)[5] the Ecosystem Approach Roadmap consisting of seven steps for the gradual application of the ecosystem approach and agreed on an ecological vision for the Mediterranean and three strategic goals. In COP17 (Paris, France, February 2012) the Contracting Parties recognized the ecosystem approach as a guiding principle for the overall work under the MAP - Barcelona Convention. The ecosystem approach aims to ensure that all the different activities are managed in an integrated manner and that cumulative impacts are addressed, in the framework of the MAP - Barcelona Convention, in order to reach GES. Under the ecosystem approach a set of 11 Ecological Objectives were adopted by COP 17 as well as associated Operational Objectives, and indicators[6], while COP 18 (Istanbul, Turkey, December 2013) further adopted an integrated list of Mediterranean Good Environmental Status (GES) and related targets[7]. COP 19 (Athens, Greece, February 2016) adopted common and candidate indicators as the basis for the Integrated Monitoring and Assessment Programme (IMAP)[8].

6. The revised Mediterranean Strategy for Sustainable Development (2016-2025), adopted by the COP19[9], sets out the following targets and timetables:

Table 1. Mediterranean Strategy for Sustainable Development (2016-2025) targets

Deadline	Target

[5] Decision IG.17/6 on implementation of the ecosystem approach to the management of human activities that may affect the Mediterranean marine and coastal environment
[6] Decision IG. 20/4 Implementing MAP ecosystem approach roadmap: Mediterranean Ecological Objectives and Operational Objectives, Indicators and Timetable for implementing the ecosystem approach roadmap
[7] Decision IG.21/3 on the Ecosystems Approach including adopting definitions of Good Environmental Status (GES) and targets
[8] Decision IG.22/7 Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria
[9] Decision IG.22/2 Mediterranean Strategy for Sustainable Development 2016-2025

2020	Conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on best available scientific information
2020	Effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics
2020 [2030]	Take urgent and significant action to reduce the degradation and fragmentation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species, and take further action as needed by 2030
2030	Enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries
2030	Substantially reduce waste generation through prevention, reduction, recycling and reuse
2025	The majority of Mediterranean countries are committed to green or sustainable public procurement programmes
2025	Two-thirds of Mediterranean countries have acceded to the Aarhus Convention

3. Present report

7. In line with the Ecosystem Approach Roadmap, the Secretariat prepared in 2015 the Ecosystem Approach Based Measures Gap Analysis (hereinafter referred to as 2015 gap analysis) which was submitted to and reviewed by the 5th Ecosystem Approach Coordination Group (CG) Meeting, held in Rome, Italy, in September 2015 (UNEP(DEPI)/MED WG.420/5). This meeting requested the Secretariat to finalize the stocktaking component of the 2015 gap analysis for submission to the COP 19 (UNEP (DEPI)/MED IG.22/Inf.15) and further elaborate it after the COP 19 in view of assessing the current and prospective status of "GES" of the Mediterranean strictly related to the existing MAP - Barcelona Convention measures and quantify where appropriate the deviations or related trends from the agreed GES targets. Therefore, the goal of the present report is to identify the need for additional or updated existing measures in order to achieve and/or maintain GES at ecological objective level. In this respect, the MAP Programme of Work (PoW) 2016-2017, adopted by COP 19 (Decision IG. 22/20), mandated the Secretariat to "*prepare a midterm review of the implementation of the EcAp application roadmap including a policy paper on potential additional and integrated programmes of measures to achieve GES in the Mediterranean also taking into account climate change*" (activity 1.1.2.7)

8. The present report tries to identify the main pressures and drivers in the Mediterranean Region, to list the measures adopted at regional level to combat the identified pressures, to outline their efficiency against GES targets and to finally identify the capacity of measures to bridge the gap between the current situation and GES.

9. When gaps in measures are identified, the present report highlights the need for either strengthened implementation, in cases where measures exist but a lack of implementation and enforcement is noticed or adoption of new measures, in cases where an environmental pressure is not fully addressed at regional level, by proposing for some cases potential measures to be considered. The

present report has a regional dimension, analyzing the measures adopted in the framework of MAP - Barcelona Convention and its Protocols. However, existing measures adopted by the Contracting Parties at national level, through the available updated National Action Plans (NAPs)/ Programmes of Measures (PoM) have been reviewed in order to define potential measures that could be taken at regional level, where appropriate.

10. The main pressures addressed by the present report are presented in the following table:

Table 2. Main pressures and relevant regional legislation, policies and programmes of measures

Pressure	Relevant regional legislation, policies and programmes of measures
Eutrophication/ nutrients	LBS Protocol SAP/MED Regional Plans on BOD5 reduction from urban wastewater and the food sector
Contaminants	LBS Protocol Dumping Protocol HZ Protocol Offshore Protocol & Action Plan SAP/MED Regional Plans on priority contaminants (mercury, and POPs) Regional Strategy on pollution from ships
Marine Litter	LBS Protocol SAP/MED Regional Plan on Marine Litter Management in the Mediterranean (MLRP)
Pressures on biodiversity	SPA/BD Protocol SAP/BIO Species Action Plans
Non-indigenous species	SPA/BD Protocol SAP/BIO Action Plan concerning species introduction and invasive species
Depletion of fish stocks	SPA/BD Protocol SAP/BIO GFCM measures
Impacts on sea floor integrity	SPA/BD Protocol SAP/BIO

	Action Plan on marine vegetation Habitats Action Plans MLRP GFCM measures

4. Measures

11. The measures required to achieve GES can be either new or existing measures that have already been adopted in the framework of other policies, such as for example the designation of MPAs and the measures set to achieve their conservation objectives, fisheries restrictions, pollution reduction and control measures etc. In the case of existing measures, their relevance to GES achievement needs to be assessed in order to measure the gap between GES and the current state and ensure a more coherent approach for their implementation. In addition it needs to be examined if those measures are fully implemented. If the measures are inadequately implemented, more incentives, support or better enforcement and/or compliance mechanisms are required. In case of insufficient measures these have to be replaced or complemented by new/updated measures.

12. In the framework of MAP – Barcelona Convention, measures have been adopted at regional level addressing different ecological objectives individually or in an integrated manner. Those measures will be presented below and cover the areas of biodiversity protection (SAP/BIO, Regional Plans, NIS, MPAs and SPAMIs), and fisheries management (technical measures, spatial and temporal restrictions etc.) as well as pollution prevention and reduction (SAP/MED, Regional Plans for priority contaminants, Regional Action Plan for Marine Litter, Regional Strategy for prevention of and response to marine pollution from ships, Offshore Action Plan).

13. On national level, with regards to pollution combat and control, the Contracting Parties developed their first National Action Plans (NAPs) in the framework of the LBS Protocol and SAP/MED in 2003-2005 and they updated them in 2015-2016, in order to take into account the new regional measures as well as the advancements in the framework of the ecosystem approach, mainly GES and related targets, regarding the Ecological Objectives 5, 8 and 9 (eutrophication, contaminants and marine litter). Furthermore, National Plans are being or expected to be developed for other key policy areas, including biodiversity (conservation of threatened and endangered species, marine key habitats, NIS and MPAs), sea-based pollution etc.

5. Methodology

14. The analysis has been conducted following a homogenous methodology and systematic approach:

- Definition of main pressures on the Mediterranean sea and coast based on existing reports
- Overall assessment of their impacts and sources
- Identification of the existing measures at regional level and the main gaps
- Identification of areas where problems are already addressed by existing measures, but better implementation is required
- Identification of problems that are not sufficiently tackled by existing measures and for which additional measures are needed
- Proposal of potential measures to be considered for the areas that are inadequately addressed so far

II. Marine Species and Habitats

1. Ecological Objective 1 related to biodiversity

a) Description of pressures, impacts and drivers

15. The Mediterranean Sea is home to rich biodiversity of fauna and flora, recognized as one of the world's 25 top biodiversity hotspots. Although it covers less than 1% of the world's ocean surface and less than 0,3% of its volume, it hosts 10,000-12,000 species, representing 4-18% of the world's known marine species (UNEP/MAP 2012 and Bianchi and Morri 2000). An important characteristic of marine biodiversity on the Mediterranean Sea is the high level of endemism, with 20-30% of the total number of species being native only to the Mediterranean Sea and can reach even 90% for certain groups, such as nesting sea birds (Zenetos et al., 2002; Boudouresque, 2009). The Mediterranean Sea is also home to important habitats, including sand dunes, coastal wetlands and lagoons. The most important Mediterranean habitats are found in the coastal strip, including *Lithophyllum byssoides* (e.g. L. Lichenoides) rims, *Posidonia oceanica* meadows and Fucal forests (biocenoses with Cystoseira), and the coralligenous communities (Zenetos et al.,2002; Boudouresque, 2004) .[10]

16. Despite its importance for the marine ecosystems, human health and socioeconomic activities, the Mediterranean biodiversity faces multiple anthropogenic pressures that affect its ecological status and peril its conservation. Impacts have been reported on the populations of different species, including birds (audouin's gull, white pelican, Dalmatian pelican, great white heron, slenderbilled gull and others), marine mammals (such as monk seal, and dolphins), cetaceans, cartilaginous fish, marine turtles and other species . Marine and coastal habitats are also heavily impacted by human activities[11]. The 2007–2012 biogeographical assessments, based on national reporting under the Habitats Directive, showed that six out of seven invertebrate species assessed in the Mediterranean Sea are in 'unfavourable conservation status'. There are many pressures on marine and coastal biodiversity, which may often act synergistically, causing cumulative effects that are even harder to assess and tackle.

17. One important driver causing decline of both commercial and non-commercial species is fisheries and more accurately unsustainable fishing practices that take place in the sea. Although assessments are very difficult to be made with regards to the state of fish stocks, because of the very limited level of knowledge, figures from the assessed stocks show a huge percentage of overfished stocks. Many species are listed as Endangered or Vulnerable on the IUCN's Red List[12]. The impacts of fishing are also important on non-commercial species, which are accidentally caught, and then discarded. Bycatch affects mainly seabirds, sea turtles and marine mammals, some of which are protected species. Unsustainable practices also adversely affect deep sea biodiversity and destroy benthic habitats.

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[10] UNEP-MAP RAC/SPA 2010. The Mediterranean Sea Biodiversity: state of the ecosystems, pressures, impacts and future priorities. By Bazairi, H., Ben Haj, S., Boero, F., Cebrian, D., De Juan, S., Limam, A., Lleonart, J., Torchia, G., and Rais, C., Ed. RAC/SPA, Tunis; 100 pages.
UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012

[11] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012

[12] http://www.iucnredlist.org/

18. Another important pressure is the introduction and establishment of invasive non-indigenous species. Some of the main impacts include increased competition for space and food, reduction of prey introduction of pathogens etc.[13]

19. The introduction of microbial pathogens and contaminants is another serious issue for marine biodiversity. Potential pathogen vectors include inadequately treated wastewater, industrial discharges, shipping discharges agricultural runoffs, aquaculture plants, and others, with significant impacts on biodiversity and human health. New pathogens have been recorded in the Mediterranean, mainly as a result of climate change and the spread of invasive non-indigenous species.[14]

20. Finally, climate change has significant impacts on marine species and habitats, especially in combination with other pressures.

b) At regional level

21. Biodiversity conservation has been and still is a priority for MAP - Barcelona Convention and an important framework is in place aiming at protecting marine biodiversity at regional level.

22. One of the main objectives of the Barcelona Convention is to "protect and preserve biological diversity, rare or fragile ecosystems, as well as species of wild fauna and flora which are rare, depleted, threatened or endangered and their habitats" (article 10). The first Protocol concerning Mediterranean Specially Protected Areas was adopted in 1982 and in 1995 it was replaced by the Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA and Biodiversity Protocol) which has as its main objective to promote the conservation and sustainable management of areas having a particular natural or cultural value and the conservation of the endangered or threatened species. Important provisions are set out in the Annexes to the Protocol, covering important issues of the biodiversity protection namely:

- Common criteria for the choice of protected marine and coastal areas that could be included in the SPAMI list
- List of endangered or threatened species
- List of species whose exploitation is regulated

23. The Strategic Action Programme for the Conservation of Biological Diversity in the Mediterranean (SAP/BIO) was adopted in 2003, providing a programmatic framework for implementing the SPA/BD Protocol. It sets out a list of priority actions, with related priority measures, as follows:

Table 3. Objectives and Priority Actions set out in the SAP/BIO

Objective	Priority Actions
Inventorying, mapping and monitoring the Mediterranean coastal and	Undertake a complete and integrated inventory (by sub-region) of sensitive Mediterranean coastal, wetland, and marine habitats
	Establish systems to monitor the trends of the main threats to Mediterranean biodiversity and the ecological and socio-economic impacts of changes in biodiversity
	Identify, develop, and validate adequate biological and socio-economic indicators

[13] UNEP-MAP RAC/SPA 2010. The Mediterranean Sea Biodiversity: state of the ecosystems, pressures, impacts and future priorities. By Bazairi, H., Ben Haj, S., Boero, F., Cebrian, D., De Juan, S., Limam, A., Lleonart, J., Torchia, G., and Rais, C., Ed. RAC/SPA, Tunis; 100 pages.
[14] UNEP-MAP RAC/SPA 2010. The Mediterranean Sea Biodiversity: state of the ecosystems, pressures, impacts and future priorities. By Bazairi, H., Ben Haj, S., Boero, F., Cebrian, D., De Juan, S., Limam, A., Lleonart, J., Torchia, G., and Rais, C., Ed. RAC/SPA, Tunis; 100 pages.

marine biodiversity	
Conservation of sensitive habitats, species and sites	Harmonise, update, coordinate and enforce legislation to conserve biodiversity
	Develop actions to conserve threatened and endangered (coastal and marine) Mediterranean species
	Protect marine and coastal sites of particular interest
	Declaration and development of new coastal and marine protected areas particularly in the south and eastern Mediterranean and offshore, including the high sea
	Strengthening existing Marine and Coastal Protected Areas
	Ensure functioning of protected area networks
Assessing and mitigating the impact of threats on biodiversity	Assess the potential impact of global warming and rise in sea level on Mediterranean coastal and marine biodiversity
	Assess the potential impact of threats to Mediterranean coastal and marine biodiversity
	Mitigate the direct impact of the international trade in endangered species
	Control and mitigate the introduction and spread of non-indigenous species
	Control and mitigate the effects of changes in land use (including coastal urbanization and construction of infrastructure)
	Promote eco- and soft tourism, control and mitigate impact of recreational activities regulating or dissuading people from such practices)
	Assessment and elaboration of strategies to prevent the environmental impact of sources of pollution
	Special focus on the control and regulation of inappropriate aquaculture practices
	Assess, control and elaborate strategies to prevent the negative impact of fisheries on biodiversity
Developing research to complete knowledge and fill in gaps on biodiversity	Improve and coordinate biodiversity research
	Improve taxonomic expertise in the region, through the constitution of PEET
Capacity-building to ensure coordination and technical support	Achieve a 'clearing-house' mechanism to focus on marine and coastal conservation activities
	Coordination and development of common tools for implementing National Action Plans (NAPs)
Information and participation	Facilitate access to information for managers and decision-makers, as well as stakeholders and the general public
	Promote public participation, within an integrated management scheme
	Preserve traditional knowledge
Awareness-raising	Develop international collaboration to enhance regional public awareness
	Organise coordinated Mediterranean-level campaigns focusing on specific regional biodiversity issues

24. In the framework of SPA/BD Protocol, a list of biodiversity-related **Action Plans** have been adopted at regional level in order to ensure better protection of specific species and habitats, including the:

- Mediterranean Monk Seal
- Marine Turtles
- Cetaceans
- Marine vegetation

- Bird species listed in Annex II of the SPA/BD Protocol
- Cartilaginous fishes
- Non indigenous species
- Coralligenous and other calcareous bio-concentrations
- Dark habitats

25. It is worth noting that the Decision IG.22/12, adopted by the Contracting Parties to the Barcelona Convention (COP19, Athens, 2016) adopted Updated Action Plans concerning "Cetaceans", "Coralligenous and Other Calcareous Bio-concretions" (as well as species introductions and invasive species, examined in the chapter 2 below). Furthermore, the COP19 in its decision IG.22/12 requested the SPA/RAC to update the Action Plan for the Conservation of Bird Species listed in Annex II of the SPA/BD Protocol and to revise the Reference List of Marine and Coastal Habitat Types in the Mediterranean for consideration by COP20.

26. Central in the protection of marine biodiversity in the Mediterranean is the designation and management of Marine Protected Areas (MPAs) and Specially Protected Areas of Mediterranean Importance (SPAMIs).

27. In this respect, in COP 19 (Athens, Greece, February 2016) the Contracting Parties adopted a Roadmap for a Comprehensive Coherent Network of Well-Managed Marine Protected Areas (MPAs) to Achieve Aichi Target 11 in the Mediterranean (Decision IG.22/13), providing for key objectives, concrete actions and timetables for the establishment and effective management of the MPAs network.

28. Despite the comprehensive framework for the protection of biodiversity at regional level, there are still important gaps that are identified, mainly in the areas of knowledge, implementation and enforcement of legislation, MPA designation and management, and financing, as follows:

Knowledge /data

- Significant gaps in knowledge exist mainly regarding the population distributional range of some species, their abundance and demographic characteristics in order to prioritize their conservation. The gaps are more important in the biodiversity of deep sea areas;
- The knowledge is also limited regarding the impacts of pathogens on marine and coastal biodiversity, especially the new pathogens[15];
- Knowledge gaps concern also the impacts of climate change on marine and coastal ecosystems, especially the impacts of acidification. The impacts of climate change are even less studied in the deep sea, even though there is a demonstration of general warming trends (about 0.12 °C in the last three decades) (Lejeusne et al., 2010)[16];
- Monitoring lacks harmonization, while there are significant gaps in monitoring systems for invasive alien species.

[15] UNEP-MAP RAC/SPA 2010. The Mediterranean Sea Biodiversity: state of the ecosystems, pressures, impacts and future priorities. By Bazairi, H., Ben Haj, S., Boero, F., Cebrian, D., De Juan, S., Limam, A., Lleonart, J., Torchia, G., and Rais, C., Ed. RAC/SPA, Tunis; 100 pages.
[16] UNEP-MAP RAC/SPA 2010. The Mediterranean Sea Biodiversity: state of the ecosystems, pressures, impacts and future priorities. By Bazairi, H., Ben Haj, S., Boero, F., Cebrian, D., De Juan, S., Limam, A., Lleonart, J., Torchia, G., and Rais, C., Ed. RAC/SPA, Tunis; 100 pages

Implementation/enforcement of existing legal and policy framework

- According to SAP/BIO analysis[17] regarding the objective to assess and mitigate the threats on biodiversity, no major or insufficient achievements have been made in the following areas:
  - Monitoring the impacts of global trade and economic policies on biodiversity, the effective control of coastal development, the enforcement of measures to control and combat international trade of endangered species, mainly due to lack of training for the competent agents and lack of resources;
  - Implementation of biodiversity protection legislation at national level;
  - Identification of hotspots is mainly based on pollution, while for other threats the identification of those areas is limited;
  - Despite the promotion of ecotourism at national level and the implementation of actions, the objective of shifting to more sustainable tourism has not been met, and further actions are required, such as the introduction of labels for sustainable tourism, incentives for the development of ecotourism facilities etc;
  - Despite the development of the aquaculture activities and the future scenarios that predict a significant increase of the sector, there are not sufficient measures in place to prevent and tackle the negative environmental impacts of aquaculture and only a few countries have integrated the setting aside of sites for fish farming into their spatial planning.
- Some important gaps can be derived also from the analysis of implementation of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean during the biennial period 2014-2015[18] revealing a low level of implementation (less than half of the assessed countries) of the following measures:
  - Integrating emergency plans and measures;
  - SPAMIs designation;
  - National Strategies and Action Plans for the conservation of biodiversity;
  - Banning and regulation of activities involving the capture of species from SPAs;
  - Gaps in the implementation of species actions plans, especially those on cartilaginous fish, cetaceans and non-indigenous species introductions.
- Important gaps exist in the enforcement and control of the biodiversity related legislation, particularly in the areas of fisheries and invasive alien species;
- There are no sufficient restoration measures and targets;
- There are important gaps in biodiversity financing to be addressed.

MPA designation and management

- The designation and management of MPAs and other effective area-based conservation measure is insufficient, and upscale efforts are required in order to meet the Aichi target of 10% of the region covered by MPAs. At regional level, around 7,14% of total surface is covered by MPAs[19]. In particular the main problems are the following:
  - MPAs are not representative of the full range of species and habitats[20]. Except for rare cases, the MPAs are designated in coastal waters under national jurisdiction. In addition, the MPAs are

[17] SAP/BIO Implementation: the first decade and the way forward (as reviewed by the National Correspondents of SAP/BIO in July 2013), document UNEP(DEPI)/MED WG.382/5;
UNEP/MAP, 2015. Draft Ecosystem Approach based Measures Gap Analysis. UNEP(DEPI)/MED WG.420/5
[18] UNEP(DEPI)/MED WG. 431/3, 2017
[19] MedPAN & UNEP-MAP-SPA/RAC. 2016. The 2016 status of Marine Protected Areas in the Mediterranean: Main findings. MedPAN & SPA/RAC Ed., 16 pp
[20] Gabrié C., Lagabrielle E., Bissery C., Crochelet E., Meola B., Webster C., Claudet J., Chassanite A., Marinesque S., Robert P., Goutx M., Quod C. 2012. The Status of Marine Protected Areas in the Mediterranean Sea. MedPAN & RAC/SPA. Ed: MedPAN Collection. 256 pp

not equally distributed across the region[21]. This means that important habitats in some regions are not equally taken into account;

- There is a problem of connectivity and coherence[22]: in order for protection networks to reach the maximum potential of protection, they have to be coherent and allow exchanges of the species. Studies suggest a maximum distance of 80 km;
- Management plans are not adopted for all the MPAs, while some of the existing plans are not adequately addressing the conservation needs of the sites;
- The value of the ecosystem services provided by the oceans is largely unknown. Knowledge in this area is limited also for MPAs;
- There is lack of financial resources required to properly manage MPAs.

c) Gaps and proposals

29. The following table lists the main measures for biodiversity protection for which there are significant gaps, and overall issues for which better implementation of existing measures or adoption of new/updated measures should be considered:

Table 4. Gaps related to measures for biodiversity

Key Measures	Gaps related to measures
SAP/BIO measures	Stronger implementation of the Plan is needed, especially with regards to the following areas: - Adoption of national biodiversity laws; - Control of coastal development; - International trade of endangered species; - Promotion of sustainable tourism; - Regulation of aquaculture; - Banning of or restrictions in harmful activities ; - Prevention and control of introduction and spread of invasive alien species.
MPAs	• Coverage of sea surface by MPAs is insufficient and stronger implementation efforts are required to ensure the following goals: - Expansion of the MPA network in the whole region to achieve at least the 10% coverage target; - Representation of the full range of species and habitats and equal distribution across the region; - Better connectivity and coherence. A potential additional measure should be to set a maximum distance requirement (i.e. 80 or 100 km); - More efficient management of MPAs; - Consideration of nursery, spawning, breeding and feeding needs for the development of MPA network; - Better regulation of recreational fishing activities. - Establishment of zoning schemes with stricter levels of protection (such as reserves or no-take areas) in existing MPAs

[21] UNEP-MAP RAC/SPA 2010. The Mediterranean Sea Biodiversity: state of the ecosystems, pressures, impacts and future priorities. By Bazairi, H., Ben Haj, S., Boero, F., Cebrian, D., De Juan, S., Limam, A., Lleonart, J., Torchia, G., and Rais, C., Ed. RAC/SPA, Tunis; 100 pages.

[22] Gabrié C., Lagabrielle E., Bissery C., Crochelet E., Meola B., Webster C., Claudet J., Chassanite A., Marinesque S., Robert P., Goutx M., Quod C. 2012. The Status of Marine Protected Areas in the Mediterranean Sea. MedPAN & RAC/SPA. Ed: MedPAN Collection. 256 pp

	• The management of MPAs is in some cases insufficient. Measures should be adopted that require the definition of conservation objectives for all the MPAs and the establishment of management plans in line with these objectives;
Spatial measures other than MPAs	Application of complementary measures to MPAs network is weak and other spatial measures may be considered to manage harmful activities including[23]: - Protection of essential fish habitats or stock recovery areas; - Real time closure areas to combat bycatch; - Special fishing licenses in sensible/vulnerable areas based on fishing impact assessments; - Banning of gravel extraction or fisheries inside wind farms or shipping lane.
Measures for aquaculture activities	This sector is not adequately addressed at regional level. Stricter technical guidelines and management standards, or even Regional Plans are required to tackle the impacts of aquaculture on biodiversity (for more information see Chapter 2).
Measures for fishing activities	Adoption of new measures and better enforcement and control of the existing measures are needed. (For more information see Chapter 3).
Measures for prevention/control of NIS	New measures and better implementation and enforcement of existing measures are required. (For more information see Chapter 2).
Implementation of Biodiversity Action Plans	Several actions were developed to successfully implement the action plans objectives at national level in the framework of the SPA/BD Protocol. Nevertheless, enhanced implementation is required in the areas identified in the list above, based on the "Status of implementation of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean".
Restoration	New measures are needed aiming at restoring degraded ecosystems, including : - Establishment of a regional restoration target of degraded ecosystems; - Evaluation of the cost of degradation.
Overall issues	**Gaps related to measures**
Lack of Knowledge	The existing measures providing for enhanced research and information on biodiversity should be further implemented to fill the knowledge gaps related to: - Population size, distribution, abundance and conservation status of some species; - Deep sea ecosystems; - Impacts of pathogens, especially new pathogens; - Impacts of marine litter; - Impacts of climate change; - Invasive alien species and their impacts; - Value of ecosystem services from MPAs.
Financing	Enhanced financing needs to be foreseen for biodiversity protection at regional and national levels.

[23] European Commission DG Environment 2014, Recommendation on Programmes of Measures (Annex to doc MD 2014-1/1)

2. Ecological Objective 2 related to non-indigenous species (NIS)

a) Description of pressures, impacts and drivers

30. The introduction and spread of invasive alien species adversely affects biodiversity, and it is a problem that is often too difficult to tackle, if not detected and handled in an early stage. The Mediterranean Sea is severely affected by introductions of non-indigenous species that have been increasing in recent years with an estimated number of around 1,000[24], of which more than half is considered established[25]. According to the State of Europe's Sea[26], the Mediterranean has the largest number of non-indigenous species among European Seas. The Aegean-Levantine Sea is the most affected region, with over 160 new species recorded from 2000 to 2010[27].

31. The following table extracted from the UN Environment/MAP SPA/RAC 2010 Report "The Mediterranean Sea Biodiversity: state of the ecosystems, pressures, impacts and future priorities"[28] shows the main pressures and impacts related to invasive alien species.

Table 5. Main pressures and impacts of invasive alien species

Pressures	Impacts
Competition for space and/or food	Reduction and niche contraction of native species; replacement of native species; other indirect ecosystem effects including negative impact on structures and functioning of the ecosystems
Predation (or grazing)	Reduction of prey (or vegetation) mainly because native prey species may not have evolved defences against the novel predators; other indirect ecosystem effects including negative impact on structures and functioning of the ecosystems
Hybridizing with native species	The invaders genes "flood" the native species, such that no individuals contain the entire genotype of the native species, thus effectively driving the indigenous species to extinction
Introduction of pathogens	Reduction of indigenous species devoid of defences against new pathogens; other indirect ecosystem effects

Source: UNEP-MAP RAC/SPA 2010. The Mediterranean Sea Biodiversity: state of the ecosystems, pressures, impacts and future priorities.

32. The impacts of invasive alien species may be of a level to change the structure and functioning of the ecosystem, as in the case of the clam *Ruditapes philippinarum* (Occhipinti Ambrogi, 2002)[29]. The socioeconomic impacts of invasive alien species are also significant, as they affect adversely many different human activities that depend on healthy and productive ecosystems, such as fishing, aquaculture, and tourism, while also threatening public health. Examples from the Mediterranean region include the

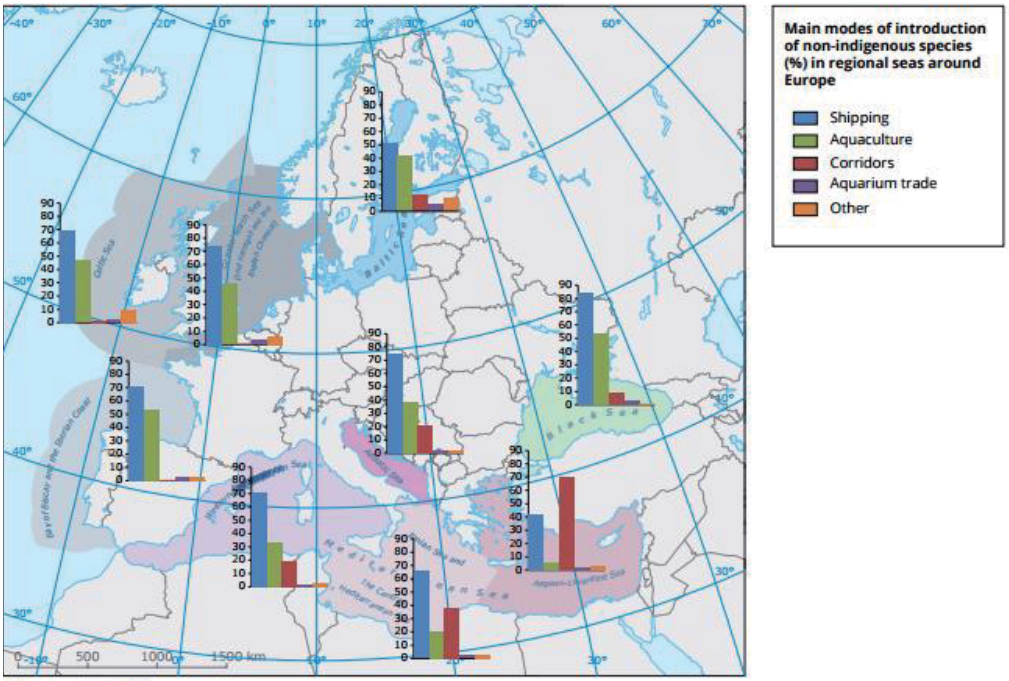
[24] http://www.medit-mar-sc.net/index.php/marine/article/view/327
[25] UNEP/MAP Decision IG.22/12 Annex III
[26] State of Europe's seas, European Environment Agency, 2015
[27] http://www.eea.europa.eu/data-and-maps/indicators/trends-in-marine-alien-species-mas-2/assessment
[28] UNEP-MAP RAC/SPA 2010. The Mediterranean Sea Biodiversity: state of the ecosystems, pressures, impacts and future priorities. By Bazairi, H., Ben Haj, S., Boero, F., Cebrian, D., De Juan, S., Limam, A., Lleonart, J., Torchia, G., and Rais, C., Ed. RAC/SPA, Tunis; 100 pages
[29] UNEP-MAP RAC/SPA 2010. The Mediterranean Sea Biodiversity: state of the ecosystems, pressures, impacts and future priorities. By Bazairi, H., Ben Haj, S., Boero, F., Cebrian, D., De Juan, S., Limam, A., Lleonart, J., Torchia, G., and Rais, C., Ed. RAC/SPA, Tunis; 100 pages

spread of *lagocephalus sceleratus*, the invasion of cornetfish *Fistularia commersonii*, blooms of jellyfish species and others[30].

33. The establishment and proliferation of non-indigenous species is linked to the state of the environment they invade. Degraded ecosystems that face significant pressures are more vulnerable to the establishment and spread of non-indigenous species than healthy ecosystems. The increase of the anthropogenic pressures on the Mediterranean environment in the recent years may therefore be one of the reasons for the expansion of invasive non-indigenous species. On the other hand, this can be a key solution to address the problem, by restoring and preserving for example key ecosystems, in order to reinforce their resilience to introductions of invasive species.

34. Although there are important gaps in our knowledge about invasive NIS, we know that the main vectors of introduction are shipping (fouling on ship hulls, ballast water etc.), aquaculture and natural corridors (Suez canal/Straits of Gibraltar)[31]. The importance of each pathway varies even in the same regional sea, from a sub-regional zone to another (see figure 1). Climate change is also expected to play an important role in future introduction and spread patterns of alien species. According to recent studies increased sea temperatures will enhance the spread of non-indigenous species.[32]

Figure 1: Main pathways of introduction of NIS per regional sea (Source EEA, 2015f)



Source: EEA, 2015f.

b) At regional level

35. The problem of invasive alien species is of particular importance for the Mediterranean Sea and has long been known and studied in the framework of MAP - Barcelona Convention. In the framework of the Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol), the Action Plan on introductions of Species and Invasive Species was adopted by the

[30] Marine Alien Invasive Species Strategy for the MedPAN Network, 2012
[31] State of Europe's seas, European Environment Agency, 2015
[32] Otero, M., Cebrian, E., Francour, P., Galil, B., Savini, D. 2013. Monitoring Marine Invasive Species in Mediterranean Marine Protected Areas (MPAs): A strategy and practical guide for managers. Malaga, Spain: IUCN. 136 pages.

Contracting Parties to the Barcelona Convention in 2003 in order to serve as a Mediterranean Strategy to face up to the issues posed by the introduction of non-native marine species. The 19th Meeting of the Contracting Parties to the Barcelona Convention adopted in 2016 an **updated Action Plan concerning Species Introductions and Invasive Species in the Mediterranean Sea**. The Action Plan has, as its main objective, to promote the development of coordinated efforts and management measures throughout the Mediterranean region in order to prevent as appropriate, minimize and limit, monitor and control marine biological invasions and their impacts on biodiversity, human health, and ecosystem services focusing among others on strengthening capacities, supporting information networks, further developing MAMIAS (the regional platform for collection, exploitation and dissemination of information on marine biological invasions in the Mediterranean), strengthening institutional and legislative frameworks, conducting baseline studies and establishing monitoring programmes, setting up cooperation and information exchange mechanisms, and elaborating guidelines and technical documentation.

36. Thirteen priorities (at national and regional levels) are set out in the updated Action Plan, focusing mainly on data collection, knowledge improvement, impact assessment, measures implementation for prevention and control, training, awareness raising and cooperation.

37. A series of concrete actions for the achievement of the provided objectives, together with implementation timetable, are found in the Annex to the Action Plan.

Table 6. Measures provided for by the Action Plan on introductions of Species and Invasive Species

Action	Deadline	Level
1. Preparation of national reports, on issues listed in the Action Plan (including inventorying of alien marine species, trends in abundance, temporal occurrence and spatial distribution, ratio between invasive alien and native species, impacts, steps taken for introduction prevention and control, institutional framework for the control of species introduction, horizon scanning for future threats, and participation at pertinent international initiatives)	2016	National
2. Set up a mechanism to promote and coordinate the actions listed in paragraph 22 of the Action Plan	2016	National
3. Launch MAMIAS (referring to paragraph 24 of the Action Plan)	2016	Regional
4. Preparation of forms for reporting to MAMIAS (referring to paragraph 19 of the Action Plan)	2016	Regional
5. Baseline study with information for MAMIAS (referring to paragraph 19 of the Action Plan)	2017	National
6. Develop programmes for data collection and monitoring (referring to paragraph 18 of the Action Plan)	2017	National
7. Launch the procedures for enacting or strengthening national legislation governing the control of alien species introduction (Referring to paragraph 21 of the Action Plan)	2017	National
8. Establish/update a directory of relevant specialists and organisations (Referring to paragraph 22 of the Action Plan)	2017	National, Regional
9. Develop programmes to raise the awareness of the general public and target groups, including decision-makers, concerning the risks associated with species introduction (Referring to paragraph 22 of the Action Plan)	2017	National
10. Develop online tools and web services for searching the database and extracting data (Referring to paragraph 24 of the Action Plan)	2017	Regional
11. Annual updates of national data for MAMIAS (Referring to paragraph 20 of the Action Plan)	2017-2019 (annually)	National

12. Develop and implement risk-assessment techniques (Referring to paragraph 22 of the Action Plan)	2018	National
13. Develop online mapping tools (Referring to paragraph 24 of the Action Plan)	2018	Regional
14. Organise the regional training session (Referring to paragraph 26 of the Action Plan)	2018	Regional
15. Elaborate the National Plans (Referring to paragraph 23 of the Action Plan)	2019	National
16. Develop an early warning system in the framework of MAMIAS (Referring to paragraph 24 of the Action Plan)	2019	Regional
17. Establish collaborations and links between MAMIAS and other international systems and organizations (Referring to paragraph 25 of the Action Plan)	2019	Regional
18. Preparation of material for public education and awareness (Referring to paragraph 27 of the Action Plan)	2020	National, Regional
19. Develop online tools in MAMIAS for statistics and indicators, especially to support EcAp (Referring to paragraph 24 of the Action Plan)	2020	Regional

38. As follow up to the 2003 Action Plan, SPA/RAC developed a **Guide for Risk Analysis assessing the impacts of the introduction of non-indigenous species**, and **Guidelines for controlling the vectors of introduction into the Mediterranean of non-indigenous species and invasive marine species**[33]. The Guide for Risk Analysis assessing the impacts of the introduction of non-indigenous species analyses different approaches doe risk assessment related to NIS, including species level, vector-based and pathway, while giving definitions of relevant terms. The Guidelines for controlling the vectors of introduction into the Mediterranean of non-indigenous species and invasive marine species aim at preventing further loss of biological diversity due to the deleterious effects of the intentional and unintentional introductions of alien invasive species, while encouraging environmentally-sound and responsible use of the Mediterranean marine environment. The Guidelines provide recommendations for the main vectors of introduction, namely ballast waters, hull fouling, and aquaculture. Specific issues are addressed with regards to each pathway, as follows:

- Ballast Waters: Ballast Water Convention, ballast water exchange in the Mediterranean region, inter-Mediterranean voyages, regional early-warning systems;
- Hull fouling: International, EU and National framework, goals and objectives, knowledge and research, awareness, prevention and control, SPA/RAC role;
- Aquaculture: background, goals and objectives, knowledge and research, awareness, prevention, eradication and control, SPA/RAC role.

39. In addition, the **Strategy on ship's Ballast Water Management (BWM)** was adopted by the COP17, with the objective to develop a regional harmonized approach in the Mediterranean on ship's ballast water control and management, in line with the International Ballast Water Convention (BWM Convention). It sets eight Strategic Priorities, an Action Plan and timetable for its implementation and specific action points. The Strategic Priorities are the following:

- Support international instruments developed to minimize the introduction of invasive alien species in the Mediterranean;
- Maintain capacity building activities and initiatives in the Mediterranean region;
- Develop advances knowledge on environmental conditions of the Mediterranean and ship's mediated introduction of invasive alien species;

[33] http://www.rac-spa.org/sites/default/files/doc_alien/ld_analyse.pdf
http://www.rac-spa.org/sites/default/files/doc_alien/ld_controle.pdf

- Use of risk assessment as a reliable tool to assist in ballast water management decision-making and in compliance, monitoring and enforcement procedures;
- Decide upon voluntary regional arrangements in the Mediterranean and ensure that sub-regional and national strategies are in line with these;
- Consider other regional seas strategies and initiatives;
- Keep the Strategy and Action Plan under review and assess the implementation progress;
- Work on the identification of adequate resources to implement activities under the Strategy and Action Plan.

40. Finally the **GloBallast Partnerships Project in the Mediterranean Region** operated from 2008 to 2012, focusing on vulnerable developing States, with a view to assist them in implementing sustainable, risk-based mechanisms for the management and control of ships' ballast water and sediments and subsequently minimize the adverse impacts of aquatic invasive species transferred by ships.

c) Gaps and proposals

41. The following table lists the main sectors related to the introduction of non-indigenous species and overall issues for which there are not efficient measures, or the measures adopted at regional level are not adequately implemented.

Table 7. Gaps related to measures for non-indigenous species

Introduction vectors	Gaps related to measures
Ballast Waters	Gaps in implementation of the Mediterranean strategy for ballast waters and need for strengthened efforts (especially adoption of national legislation, measures to combat and monitor discharges of ballast water, development of National Action Plans etc.)
Aquaculture	This important vector is not adequately addressed at regional level. Stricter technical guidelines and management standards, or regional plans on aquaculture should be considered. New measures to be considered in order to ensure that aquaculture activities are not contributing to the introduction and spread of non-indigenous species may include: - establishment of stricter and better inspected permit system for aquaculture, - restrictions of aquaculture in open system plants, - contingency plans developed by aquaculture operators for the control, early warning and recovery of escapes, and - preventive maintenance actions - full integration of aquaculture activities in MSP
Overall issues	**Gaps related to measures**
Implementation of the IAS Action Plan	During the last decade our knowledge on alien species in the Mediterranean, their pathways and gateways of introduction, their spatial distribution, and their impacts has been substantially improved through many basin-wide, national, and local studies. However, as new species arrive and the already established species keep expanding their range, continuous efforts for monitoring and reporting are needed. Many Contracting Parties made important steps in adopting legislation to control the introduction of alien species, assessing the status regarding biological invasions in their territorial waters, and improving the monitoring and control of ballast waters. Despite the progress made, there are still identified gaps in the implementation of the IAS Action Plan. Indeed, many Mediterranean countries still lack national inventories of alien species, and the monitoring and reporting efforts vary substantially across the

	Mediterranean. Moreover, there are still important gaps in our knowledge on the impacts of alien species on biodiversity and ecosystem services. Most reported impacts are based on weak evidence. Quantification and mapping of impacts is missing, as well as a better understanding of how human pressures facilitate many invasions. The updated Action Plan must be fully implemented, especially in areas where the implementation of the 2003 Action Plan was found insufficient, such as : - Adoption of legislation to control introductions - Development of mechanisms to fight and monitor the ballast water discharges in territorial waters - Development of national Action Plans to combat introductions and mitigate their harmful impacts - Establishment of training and awareness programmes
Control	Import/export controls are insufficient. There is need for full implementation of actions set out in the updated Action Plan aiming at enhancing control of the introduction and spread of invasive alien species must be achieved, including through training and awareness raising.
Knowledge	Significant knowledge gaps on NIS exist, especially regarding the ways of introduction, the conditions that enable or support their reproduction and spread, the impacts on native species, the socioeconomic impacts, the cumulative and synergistic effects on biodiversity etc. Better implementation of measures aiming at enhancing research and knowledge is required.
Management	There are gaps in the development of sub-regional lists of priority IAS. Strengthened actions are required to develop sub-regional lists of priority IAS taking into account, where appropriate, the Guidance on developing invasive alien species national and sub-regional lists, prepared by SPA/RAC.

3. Ecological Objective 3 related to commercially exploited fish and shellfish

a) Description of pressures, impacts and drivers

42. Fishing is one of the most important economic sectors for the Mediterranean region, providing jobs for thousands of people and supporting the socioeconomic development of the region, especially in the coastal areas. However, unsustainable fishing practices cause serious impacts on marine and coastal biodiversity, threatening the good environmental status of the sea and jeopardizing the future development of the sector itself.

43. The most important impacts of fishing activities include the depletion of commercial fish stocks, due to overfishing, the incidental catches of non-target species (bycatch) and the damage on important habitats due to unsustainable fishing practices.

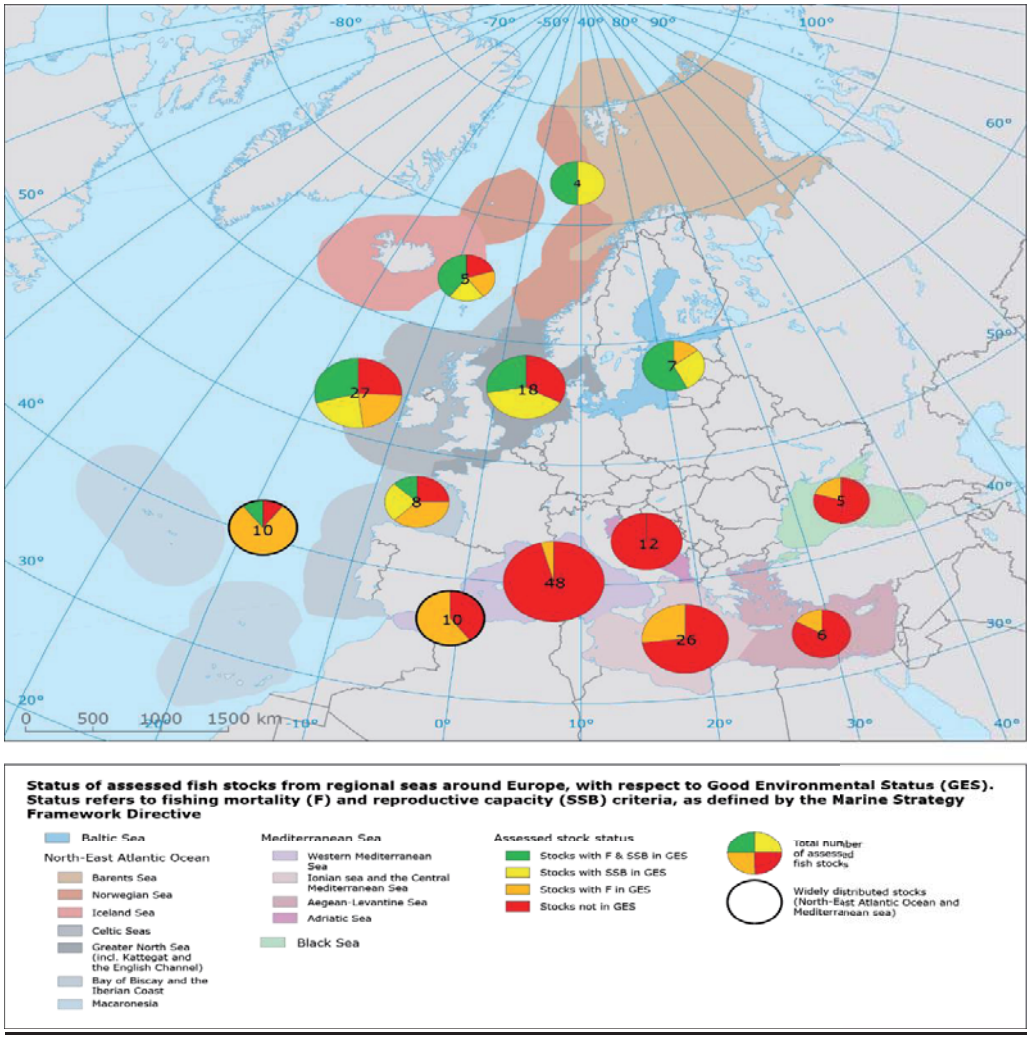


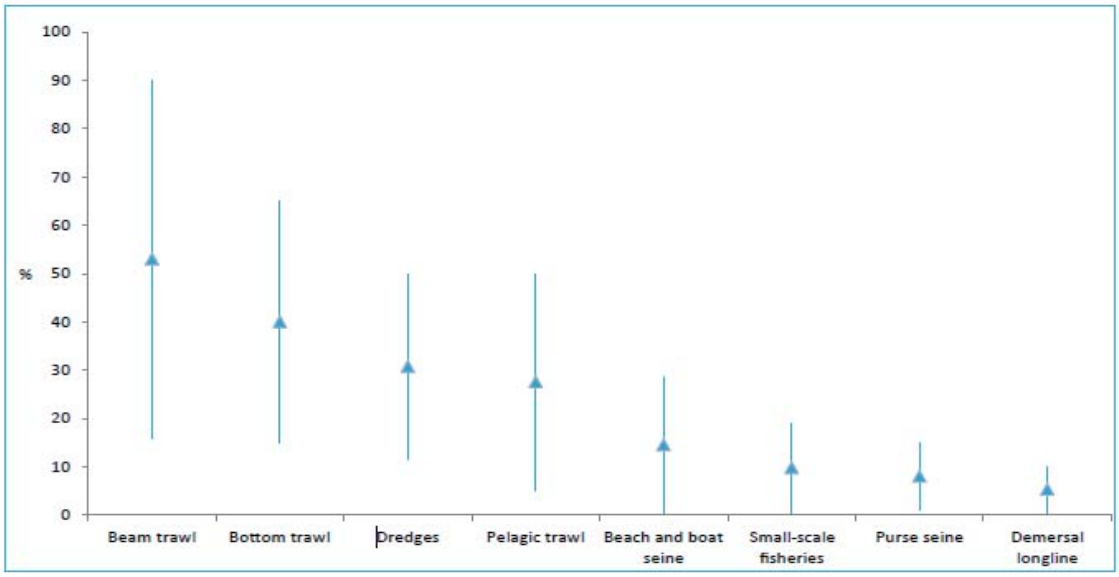
Figure 2. Status of assessed stocks in Europe (Source: http://www.eea.europa.eu/data-and-maps/figures/status-of-fish-stocks-in-1)

44. According to the GFCM's Report "the State of the Mediterranean and Black Sea Fisheries 2016"[34] *85 percent of stocks (in both Seas) for which a validated assessment exist are fished outside biologically sustainable limits*, while the State of Europe's Seas 2015 states that 91% of the assessed stocks in the Mediterranean are overfished (EC, 2014a)[35]. The overall fishing mortality for all the species assessed by GFCM is 2.5 times higher than the reference point, with hake having the highest fishing mortality rate across the Mediterranean (5 times higher than the target level), and only two assessed species in the Mediterranean and Black Sea (sprat and picarel) having fishing mortality rates lower than the target[36]. The impacts of overfishing are reflected in the composition of certain stocks which are dominated by juveniles. Particular attention needs to be paid upon this issue, as besides the indication of high fishing pressure, the overfishing of juveniles can cause population changes, with long term effects on the sustainability of stocks (UNEP/MAP 2012)[37]. The recovery of stocks becomes even more challenging when overfishing is combined with other stressors, such as pollution, invasive alien species, climate change effects etc.

[34] The State of Mediterranean and Black Sea Fisheries, FAO 2016
[35] State of Europe's seas, European Environment Agency, 2015
[36] The State of Mediterranean and Black Sea Fisheries, FAO 2016
[37] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012

45. The fishing practices with the highest bycatch impacts are beam trawls (discard volume of 69.4-90.4% of the total catch), the bottom trawls (discard volume of more than 40 percent of the total catch) and dredges (discard volume of around 50 percent of the total catch)[38] while loglines and driftnets are also responsible for significant numbers of bycatch. The most affected species are marine mammals (trawls, purse seines, static nets, longlines), sea turtles (trawls, longlines), seabirds (trawls, static nets, longlines), sharks and rays (trawls, longlines)[39]. Recent studies estimate that in the Mediterranean Sea there are over 132,000 turtle captures per year, with pelagic long lines estimated to capture 57,000 turtles per year (Casale, 2011). These captures result in an estimated 44,000 turtle deaths per year (Casale, 2011)[40].

Figure 3. Range of discard behaviour by fishing activity



Source: The State of Mediterranean and Black Sea Fisheries, FAO 2016

46. One special characteristic of the fishing sector in the Mediterranean is that small-scale fisheries represent an important part of the sector. In both the Mediterranean and the Black Sea, small-scale fisheries represent around 80% of the fleet and 20% of the total value of landings (FAO, 2016)[41].

47. ALDFG represents another important threat for marine biodiversity as they continue to catch fish and other species. This problem is addressed more in detail in the chapter on marine litter below.

48. Sustainable aquaculture can support the conservation of marine environment, by alleviating the pressures for some key target species. However, if not adequately regulated and well planned, aquaculture can cause significant pressures to marine and coastal ecosystems, contributing to the degradation of marine environment, as examined in the previous chapters. The main environmental impacts of aquaculture include the introduction of invasive alien species, nutrients and other organic matter, contaminants, diseases, and disturbance in the functioning of the natural ecosystem with possible escapes of farmed fish[42].

[38] The State of Mediterranean and Black Sea Fisheries, FAO 2016
[39] The State of Mediterranean and Black Sea Fisheries, FAO 2016
[40] State of Europe's seas, European Environment Agency, 2015
[41] The State of Mediterranean and Black Sea Fisheries, FAO 2016
[42] SWD (2016) 178 final, Commission Staff Working Document – On the application of the Water Framework Directive (WFD) and the Marine Strategy Framework Directive (MSFD) in relation to aquaculture

b) At regional level

49. Fisheries in the Mediterranean are managed by the General Fisheries Commission for the Mediterranean (GFCM), which is a regional fisheries management organization (RFMO) established under the FAO umbrella[43]. MAP and mainly SPA/RAC are also involved in fisheries issues, mainly by ensuring the protection of endangered species and habitats, in the framework of the SPA/BD Protocol to the Barcelona Convention as well as the SAP/BIO and relevant Action Plans.

50. Besides the measures that have been adopted at regional level for the protection of marine and coastal biodiversity (see chapter 1 on Biodiversity), GFCM has adopted a series of measures with the aim to promote sustainable management of natural resources.

51. With regards to **bycatch data**, where significant gaps exist, the GFCM is preparing a Strategy with a view to establish a regional database for collection and compilation of data and a regional sampling programme with observers on board. In addition, a project was jointly launched by GFCM and ACCOBAMS in 2015 to test mitigation measures aiming at reducing bycatch of vulnerable species in specific areas[44].

52. Furthermore, sixteen **management and conservation measures** have been adopted over the years by GFCM, with the objective to maintain sustainable levels of fishing and protect priority habitats and species from the adverse impacts of fishing activities. The measures, as presented in the State of Mediterranean and Black Sea Fisheries (FAO 2016)[45] are related to three general categories as follows:

- Spatial management measures[46]

They consist of fisheries restrictions in defined areas, aiming at reserving the natural resources and minimizing the impacts of fisheries, including closures to fishing or prohibition of some fishing gear with significant effects on ecologically important species and habitats. Under this tool, four fisheries restricted areas (FRA) have been designed so far, including the deep sea FRA Lophelia reef off Capo Santa Maria di Leuca, the deep sea FRA Nile Delta area cold hydrocarbon seeps, the deep sea FRA Eratosthenes Seamount and the FRA within the Gulf of Lion, covering a total area of 17.678 km² (around 0.7% of the total surface area). In addition, the use of bottom trawling has been prohibited in depths beyond 1,000 m in the Mediterranean and the Black Sea (1,731,097 km²)[47].

- Mitigation of incidental catch of vulnerable species[48]

GFCM has adopted several binding decisions aiming at protecting key species, including:

- Sharks and rays : ban of fishing activities below 1000m, prohibition of the retention, transshipment, storage, landing and sale of bigeye thresher shark and partial ban of the retention, transshipment, storage, landing and sale of most hammerhead sharks, measures for data collection improvement, other specific measures, including banning of finning practices and the capture and trade of species listed in Annex II of the SPA/BD Protocol;
- Sea turtles, seabirds and cetaceans: commitment for the Contracting Parties to monitor, record, and reduce as far as possible seabird bycatch, especially for species listed SPA/BD Protocol Annex II, implementation of management measures to mitigate and eliminate sea turtles bycatch

[43] http://www.fao.org/gfcm/background/about/en/
[44] The State of Mediterranean and Black Sea Fisheries, FAO 2016
[45] The State of Mediterranean and Black Sea Fisheries, FAO 2016
[46] The State of Mediterranean and Black Sea Fisheries, FAO 2016
[47] The State of Mediterranean and Black Sea Fisheries, FAO 2016
[48] The State of Mediterranean and Black Sea Fisheries, FAO 2016

risk, prohibition of retention, transshipment and landing of sea turtles, prohibition of using gillnet fisheries with monofilament with a diameter greater than 0.5mm, mitigation measures for the impact of bottom-set gillnet fisheries on cetaceans and others;
- Monk seals: prohibition of taking onboard, transshipping and landing, requirement for adoption of fisheries management measures reduce bycatch of monk seals etc.

- Other technical measures[49]

Those measures concern minimum legal size, gear restrictions and temporal closures for different types of fisheries, including dolphinfish fisheries using FAD, demersal trawling fisheries, measures for the exploitation of red coral etc.

A full list of GFCM binding recommendations on conservation and management measures can be found in Annex I to the present report.

GFCM has recognized the importance of **Multiannual Management Plans (MMP)** for efficient and adaptive fisheries management, specifying the objectives, the applicable rules and regulations and other relevant information for specific fisheries. The General Guidelines for the development of multiannual management plans was adopted by the 36th session of the GFCM and the MMP for small pelagic fisheries in the Adriatic Sea was adopted in 2013, while steps have been made in view of adoption of similar plans for other fisheries (Strait of Sicily, Red coral, European eel).[50]

53. An important milestone for the sustainable management of fisheries in the Mediterranean and the Black Sea was the adoption by the 40th session of GFCM of the Resolution GFCM/40/2016/2 for a **mid-term strategy (2017–2020) towards the sustainability of Mediterranean and Black Sea fisheries**[51].

Table 8. Targets, Outputs and Actions provided for by the GFCM Mid-term Strategy

Outputs	Actions
Target 1. Reverse the declining trend of fish stocks through strengthened scientific advice in support of management	
Enhanced knowledge and expertise on Mediterranean and Black Sea fisheries	- Creation of a GFCM Forum on Fisheries Science (GFCM FishForum) - Realization of regional surveys at sea including acoustic surveys for pelagic species as well as trawl surveys for demersal fisheries - Compilation of catalogues of fishing activities by GFCM subarea
Socio-economic information and analysis incorporated into scientific and management advice	- Comprehensive regional survey on the socio-economic impact of fisheries in the Mediterranean and the Black Sea - Development of bioeconomic models for the incorporation of socio-economic information into the assessment of the state of main commercial fisheries
Enhanced science-based GFCM regulations on fisheries management	- Implementation of a dedicated approach for the provision of advice to the Commission by its subsidiary bodies - Operationalization of the Review Panel to review the scientific advice formulated by the subsidiary bodies and provide conclusions to support the decision-making process of the Commission

[49] The State of Mediterranean and Black Sea Fisheries, FAO 2016
[50] The State of Mediterranean and Black Sea Fisheries, FAO 2016
[51] http://www.fao.org/gfcm/reports/statutory-meetings/detail/en/c/423828/

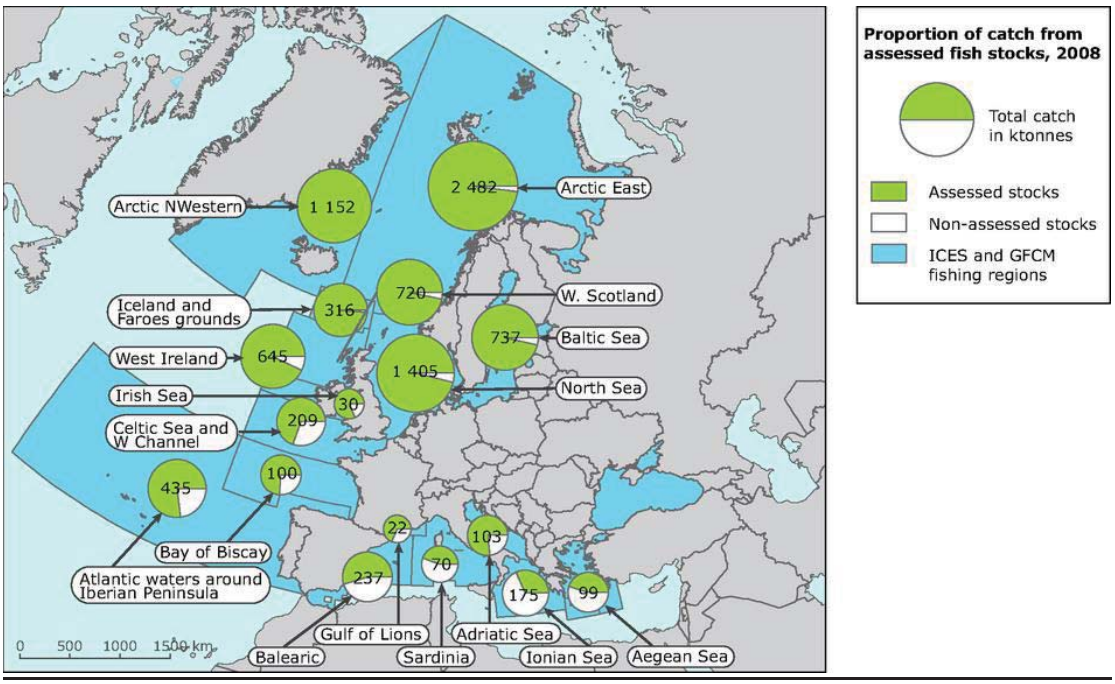
	- Revision of existing management plans / development of new management plans
Target 2. Support livelihoods for coastal communities through sustainable small-scale fisheries	
Robust and timely information on the impact of small-scale and recreational fisheries on coastal communities	- Implementation of a regional survey on small-scale fisheries - Establishment of a permanent Working Group on Small-Scale Fisheries
FAO Small-Scale Fisheries Guidelines tailored to the specificities of the GFCM area of application	- Development of national plans of action for the implementation of the SSF Guidelines - Establishment of a regional platform to engage and promote dialogue among small-scale fishing associations - Endorsement of the principle of decent work - Organization of a high-level meeting among GFCM CPCs
Target 3. Curb illegal unreported and unregulated (IUU) fishing, through a regional plan of action	
Regular quantification of IUU fishing in the Mediterranean and the Black Sea	- Assessment of the quantity, magnitude and characteristics of IUU fishing in the GFCM area of application
Reinforced inspection procedures in the framework of port State control	- Trainings of national inspectors and, as appropriate, relevant officers - Establishment of a regional information system to exchange port State measures related data
Enhanced monitoring, control and surveillance (MCS) at the regional level	- Finalization and operationalization of a regional VMS and control system
Target 4. Minimize and mitigate unwanted interactions between fisheries and marine ecosystems and environment	
Reduced bycatch rates in Mediterranean and Black Sea fisheries	- Implementation of a bycatch monitoring programme, including through the use of observers onboard commercial fishing vessels. - Development and launch of awareness campaigns at the GFCM level to educate fishers on the negative impacts of bycatch on fisheries productivity and on marine ecosystems
Healthier marine ecosystems and more productive fisheries	- Promotion of the identification and establishment of new FRAs - Adoption of a comprehensive regional management plan for red coral - Creation of an adaptation strategy to cope with potential effects of invasive species and climate change on fisheries
Target 5. Enhance capacity-building and cooperation	
Improved national capacity for the management of fisheries resources	- Provision of capacity building for CPCs, Implementation of a technical assistance mechanism to support CPCs in bridging existing gaps. - Launch of a regional programme for education and training to lay down the foundation for a new generation of fisheries experts

Strengthened fisheries governance in the Black Sea	- Organization of a high-level conference on fisheries governance - Launch of the start-up phase of a regional, scientific and technical cooperation project for the Black Sea, the BlackSea4Fish project, carried out in the remit of the WGBS
Increased cooperation with relevant actors	- Operationalization of existing MoU - Strengthened coordination with the FAO Fisheries and Aquaculture Department and FAO regional projects

54. Although important measures have already been adopted to ensure the sustainable management of fish stocks and limit any adverse impacts of fishing activities, significant problems continue to exist, mainly in the areas of knowledge, regulation of unsustainable practices and enforcement and control of existing measures:

Lack of knowledge/data

- In general, knowledge about fisheries, including the state of stocks, impacts of fishing practices etc. is extremely limited in the Mediterranean (see figure 4 below).



Note: The map shows the total catch in ICES and GFCM fishing regions of Europe. Status of fish stocks was assessed in 2009 (ICES) and from 2002-2009 (GFCM), although data refers to 2008 in the ICES regions and 2005 in the GFCM regions. Catch is divided into proportions of catch of assessed stocks (green) and catch of unassessed stocks (white).

Figure 4. Total catch in ICES and GFCM fishing regions of Europe (Source: http://www.eea.europa.eu/data-and-maps/figures/total-catch-in-ices-and-gfcm-fishing-regions-of-europe-in)

- Our knowledge is even more limited, with regards to bycatch rates and impacts;
- The method of conducting stock assessments by management units based on GSAs doesn't ensure that the whole stock is assessed[52];

[52] The State of Mediterranean and Black Sea Fisheries, FAO 2016

- Stocks assessments across the region lack homogeneity, since currently there are big differences between sub-regions[53];
- Significant knowledge gaps exist with regards to the effects of aquaculture on marine ecosystems.

Insufficient regulation of some unsustainable practices

- Existing measures have not been able to maintain stock biomass and fishing mortality at sustainable levels for all the commercially exploited fish and shellfish stocks;
- The issue of discards is not adequately tackled;
- The impacts of recreational fisheries are not fully estimated and sufficiently regulated because of a lack of catch control[54];
- Bycatch is not sufficiently addressed, and there is a lack of mitigation measures developed and tested to minimize bycatch;
- Fisheries Restriction Aras is an important measure but it has not been fully exploited, since only 4 FRAs exist for the moment;
- Despite the recognized importance of Multiannual Management Plans, there is still a reluctance of the Parties to support the management of fisheries through a common subregional plan, mainly due to uncertainties about stock units55;
- Fisheries management is mainly species-targeted and the application of the ecosystem approach is limited. The full integration of the ecosystem approach is essential to support the conservation of non-target species and critical habitats, which are impacted by unsustainable fishing practices;
- Some harmful fishing practices are still being used;
- The aquaculture sector is not sufficiently regulated at regional level.

Lack of enforcement/control

- There is general lack of control and enforcement of fishing-related measures and regulations, with variations among different Contracting Parties. The lack of efficient monitoring and control is particularly important in the High Seas, where coordinated efforts are required on regional level;

- Some particularly harmful fishing practices have been banned or restricted in the Mediterranean, such as driftnets, trawls and the using of dynamite and poison. However, according to SoER-MED56, some of those practices are still used illegally in certain areas, causing significant damage to marine biodiversity.

c) Gaps and proposals

- The following table lists the main environmental pressures and overall issues for which there are not efficient measures, or the measures adopted at regional level are not adequately implemented:

Table 9. Gaps related to measures for fish stock depletion

Environmental pressures	Gaps related to measures
Overfishing	The assessments show that the existing measures are not sufficient to reverse the fish stocks depletion trend.

[53] The State of Mediterranean and Black Sea Fisheries, FAO 2016
[54] UNEP-MAP RAC/SPA 2010. The Mediterranean Sea Biodiversity: state of the ecosystems, pressures, impacts and future priorities. By Bazairi, H., Ben Haj, S., Boero, F., Cebrian, D., De Juan, S., Limam, A., Lleonart, J., Torchia, G., and Rais, C., Ed. RAC/SPA, Tunis; 100 pages.
[55] The State of Mediterranean and Black Sea Fisheries, FAO 2016
[56] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012

	• Existing measures need to be fully implemented; • New measures should provide for maintenance/restoration of fish stock populations above biomass levels capable of producing maximum sustainable yield (BMSY) and below mortality levels capable of producing maximum sustainable yield (FMSY); • New measures should be adopted to ensure that the fleet capacity is adapted to the fishing opportunities for sustainable stock levels; • An early warning and quick reaction system needs to be established enabling the adoption of exceptional emergency measures; • Stricter measures and enhanced catch control should be adopted for recreational fishing.
Discards	New measures are needed to combat discards of incidentally caught species. The introduction of landing obligation can be considered in this regard, as a driver for more selectivity, and more reliable catch data[57].
Unsustainable fishing techniques	• There is need for better enforcement and control for the prohibited or restricted practices, that are illegally used (driftnets, trawls, dynamite, poison); • Stricter measures need to be adopted for seabed destructive fishing, e.g. general requirement for selective trawling gear; • The creation of a network of marine reserves where bottom trawling is totally banned should be considered; Other measures provided for by the Mediterranean Sea Biodiversity Report[58] include: • Increased research on new technologies to mitigate unsustainable practices and minimize bycatch, discards, ghost fishing seabed destruction etc.; • Adoption of a requirement for more selective trawling gear, (higher mesh sizes, special excluding devises etc.); • Assessment of a total exploitation ban for some particularly impacted species.
Bycatch	• Existing mitigation measures need to be better implemented and enforced; • The Strategy prepared by GFCM for collection and compiling of available data needs to be adopted and fully implemented; • More projects to test mitigation measures need to be developed; • Additional funding should be provided for prevention and mitigation measures; • Stricter measures should be adopted for high bycatch-rate fishing practices; • Examples of technological modifications provided by the Untangled symposium, December 2012; WSPA 2013[59] include : - mandatory lights on gillnets; - technology that makes the net sink or drift at a depth where its impact on animals is likely to be low; - labelling of nets etc.
Aquaculture impacts	Stricter technical guidelines and management standards, or, if need be, regional plans on aquaculture should be considered. New measures need to be adopted to ensure that aquaculture activities are adequately planned and developed sustainably and that the environmental impacts are minimized.

[57] http://ec.europa.eu/fisheries/cfp/fishing_rules/discards/index_en.htm
[58] UNEP-MAP RAC/SPA 2010. The Mediterranean Sea Biodiversity: state of the ecosystems, pressures, impacts and future priorities. By Bazairi, H., Ben Haj, S., Boero, F., Cebrian, D., De Juan, S., Limam, A., Lleonart, J., Torchia, G., and Rais, C., Ed. RAC/SPA, Tunis; 100 pages
[59] UNEP (2016). Marine plastic debris and microplastics – Global lessons and research to inspire action and guide policy change. United Nations Environment Programme, Nairobi

	Potential measures that can be considered include prevention/mitigation of impacts of nutrient inputs, prevention and mitigation of disease and parasites releases into the marine environment, minimisation of chemical discharges, prevention and minimization of escapes, and others. [60]
Overall issues	**Gaps related to measures**
Knowledge gaps	Stronger efforts and additional measures are required in order to establish more robust and harmonised monitoring and data collection systems, with a focus on the following areas: - State of fish stocks; - Bycatch (extent and mitigation measures); - Information for shared stocks; - Agreed biomass reference points for all fish stocks; - Impacts of small-scale/recreational fishing activities; - Socio economic impacts of fisheries; - Joint stock assessments; - Impacts of aquaculture on marine environment (nutrient inputs, contaminants and diseases, introduction of non-indigenous species).
Spatial protection measures	FRA is a very efficient measure but the number of existing FRAs is very limited. The implementation of this measure needs to be upscaled, with the creation of more FRA, in line with the GFCM mid-term strategy (2017–2020)
Management	Multiannual Management Plans are not widely used as a measure. The implementation of this measure needs to be upscaled, with the adoption of MMP for new areas, primarily the Straits of Sicily, red corals and European eel and the development of MMP for other fisheries, in line with the GFCM mid-term strategy (2017–2020)
Ecosystem approach	Stronger efforts are required to ensure full integration of the ecosystem approach into fisheries management. This requires: - Taking into full consideration fisheries impacts on the whole ecosystem, (non-target fish species, seabirds, marine mammals etc., as well as on marine and coastal habitats); - Full coherence of fisheries management measures with environmental legislation; - Involvement and engagement of relevant stakeholders in the whole management cycle (from decision making to implementation).

4. Ecological Objective 6 related to sea-floor integrity

a) Description of pressures, impacts and drivers

55. Deep sea habitats, including hydrothermal vents, sub-marine canyons, seamounts and the deep sea coral reefs (IUCN-WWF, 2004; IUCN, 2010) present particular interest for the marine environment in the Mediterranean, although deep waters remain largely unexplored, and data, particularly below 1000m are scarce and fragmented[61].

[60] European Commission; SWD (2016) 178 final, Commission Staff Working Document – On the application of the Water Framework Directive (WFD) and the Marine Strategy Framework Directive (MSFD) in relation to aquaculture; Brussels 2016

[61] UNEP-MAP RAC/SPA 2010. The Mediterranean Sea Biodiversity: state of the ecosystems, pressures, impacts and future priorities. By Bazairi, H., Ben Haj, S., Boero, F., Cebrian, D., De Juan, S., Limam, A., Lleonart, J., Torchia, G., and Rais, C., Ed. RAC/SPA, Tunis; 100 pages

56. Different human activities may cause adverse impacts on sea floor integrity and significantly affect deep-sea ecosystems, with the most important among them being bottom fishing, but also by dredging and offshore installations.

57. Bottom fishing and dredging can cause changes in the structure of benthic communities. Offshore installations induce direct physical impacts on the sea floor, however the full range of impacts of offshore facilities in the Mediterranean, have not been fully assessed. [62]

58. With regards to deep-sea fishing activities which cause the most damage to sea-floor, the most vulnerable species include deep-water coral ecosystems, the feather star, the sea pen, and bamboo coral beds[63]. It is estimated that a time period between 7,5 and 15 years is required for the recovery of seabed communities after one single pass of a beam trawl[64].

59. According to the SoER MED report[65], bottom gear used in fishing (mainly trawlers, and dredges) can damage the seafloor in a variety of ways, including resuspension of sediments, stirring up of contaminants, removal of large benthic species, and structural changes in benthic communities.

b) At regional level

60. There are several measures aiming at addressing the damages on sea-floor integrity that have been adopted at regional level both in the framework of MAP – Barcelona Convention and the GFCM.

61. Under MAP - Barcelona Convention system, the most relevant instruments for the conservation of see-floor integrity and deep-sea habitats are the **SPA/BD Protocol, the SAP/BIO, and the Action Plan for Marine Vegetation,** with regards to the protection of critical habitats on the sea floor with the establishment of SPA and SPAMIs.

62. Furthermore, some **GFCM measures** have been adopted with the specific aim to protect deep-sea habitats from destructive fishing practices. The most important measures are:

- The prohibition of bottom towed gear fisheries in areas deeper than 1,000 m in the Mediterranean and the Black Sea, that was endorsed in 2005 at the twenty-ninth session of the Commission, concerning an area of 1,731,097 km2, (around 58% of the total Mediterranean and the Black Sea surface area)[66].
- The establishment of four fisheries restricted areas (FRAs), located both in high seas and national waters in the Mediterranean Sea, to protect deep sea sensitive habitats and fish spawning areas in Cyprus, Egypt, Italy and France, covering a total area of 17,678 km2 (around 0.7% of the Mediterranean Sea surface area)[67].

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[62] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012
[63] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012
[64] EEA 2014, Marine messages; Our seas, our future – moving towards a new understanding
[65] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012
[66] Recommendation GFCM/29/2005/1
[67] Deep sea FRA Lophelia reef off Capo Santa Maria di Leuca (976 429 km2, GSA 19, Italy).
Deep sea FRA Nile Delta area cold hydrocarbon seeps (4 377.5 km2, GSA 26, Egypt).
Deep sea FRA Eratosthenes Seamount (10 306.2 km2, GSA 25, Cyprus).
FRA within the Gulf of Lion (2 018 4 km2, GSA 07, France).

63. It should be finally noted that the maintenance of sea-floor integrity, especially in priority benthic habitats, is one of the Ecological Objectives under the Core theme 2 (biodiversity and ecosystems) set out in the MAP Mid-term Strategy 2016-2021.

c) Gaps and proposals

64. Despite the measures that have been adopted to protect sea floor from damaging human activities, there are still important gaps that should be bridged, as follows:

Table 10. Gaps related to measures for sea-floor integrity

Sources of pressures	Gaps related to measures
Offshore Installations	The existing regional instruments (Offshore Protocol and Offshore Action Plan) only address the pollution risks deriving from the operation of offshore installations. • New measures are required to ensure prevention of significant adverse impacts on sea floor integrity from offshore installations. This could be included in the Offshore Protocol or Action Plan as a prerequisite for the issue of permits. • Our knowledge on the impacts of offshore construction on seafloor integrity in the Mediterranean needs to be improved, through better research and monitoring systems (in line with IMAP).
Fisheries	• New, stricter measures should be considered to minimize seabed destructive fishing practices, including development and support of new technologies to mitigate unsustainable techniques, the adoption of a general requirement for selective trawling gear etc. • The establishment of a network of marine reserves where bottom trawling is totally banned should be envisaged • Better enforcement and control of existing measures mainly the prohibition of bottom trawling below 1,000m • Expansion of the Fisheries Restricted Areas (FRA) measure to other sites
Dredging activities	• There is need for enhanced research on the impacts of dredging on see-floor integrity and new measures to minimize these impacts

III. Pollution and marine litter

1. Ecological Objective 5 related to eutrophication

a) Description of pressures, impacts and drivers

65. Although nutrients are essential for productive marine environments, their overload may cause the effect of eutrophication with negative impacts for the marine and coastal environment. The situation differentiates in different parts of the Mediterranean Sea. In its biggest part, the Mediterranean is oligotrophic, with very low nutrient concentrations. However there are important eutrophication hotspots, due to nutrient overenrichment from human activities, mainly nitrogen and phosphorus. The main sources for this type of marine pollution are sewage, agricultural run-off and organic chemical and fertilizer industry[68] (see figure 5 below, original sources SoER-MED, 2012). Eutrophication problems in the Mediterranean are therefore mainly occurring in areas with limited water exchange with the open sea[69].

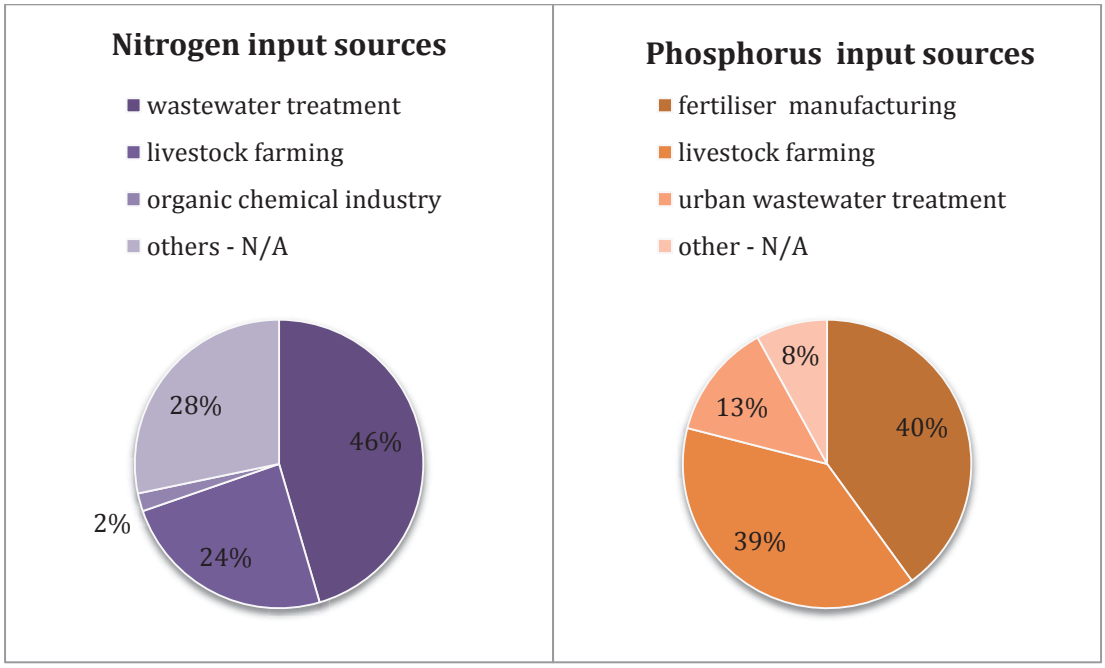

Figure 5. Nutrient input sources (Source: SoER-MED, MAP 2012)[70]

66. Aquaculture is also a significant source of nutrients, especially in countries where aquaculture activities are more developed, such as Spain, Greece, Turkey, Italy and Croatia (MAP MED POL, 2012)[71].

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[68] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012

[69] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.

[70] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012

[71] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012

67. Eutrophication has various adverse impacts on marine environment, such as changes in species composition, rapid growth of phytoplankton, reduced transparency of the water column, and oxygen depletion.[72] The most important impacts of eutrophication is the development of algal blooms and red tides. In large concentrations algal blooms can produce biotoxins, with high risks to marine organisms and human health, and significant socioeconomic impacts[73].

68. The reduced water transparency and the use of oxygen for the decomposition of dead algae may create hypoxic or even anoxic zones. Many Mediterranean species have been impacted by eutrophication, with echinoderms and crustaceans being the most vulnerable ones, while significant impacts on sea grass meadows have also been identified.[74]

69. In addition, there are considerable socioeconomic impacts, including reduced catches for fishermen, because of fish and shellfish mortality, loss of employment and reduction of incomes, degradation of the landscape, loss of tourism etc.

b) At regional level

70. The problem of eutrophication in the Mediterranean Sea is tackled at regional level mainly through the LBS Protocol to the Barcelona Convention, the Strategic Action Programme to Address Pollution from Land-Based Activities in the Mediterranean Region (SAP/MED) and the Regional Plans adopted in the framework of the implementation of Article 15 of the LBS Protocol.

71. The SAP/MED, adopted by the Contracting Parties in 1997 (COP10) specifically addresses eutrophication in its Point 5.2.5, identifying as main anthropogenic sources of nutrients the: a) Municipal sewage; b) Industrial waste water; c) Agriculture; and d) Atmospheric emissions. Specific targets and activities are provided for by the Programme, as indicated in the table below:

Table 11. Activities provided for in the SAP/MED

Activities	Level
Municipal sewage Target 1. By the year 2025, to dispose all municipal waste water (sewage) in conformity with the provisions of the LBS Protocol Target 2. By the year 2005, to dispose sewage from cities and urban agglomerations exceeding 100.000 inhabitants and areas of concern in conformity with the provisions of the Protocol	
By the year 2000, to update and adopt the 1986 guidelines for sewage treatment and disposal and, as appropriate, environmental quality criteria and standards	Regional
To develop programmes for sharing and exchanging technical information and advice regarding environmentally sound sewage treatment and facilities, including the use of treated waste water and of sewage sludge	Regional
To promote research programmes to identify and validate sewage treatment technologies	Regional

[72] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.
[73] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012
[74] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012

To update and adopt, over a period of two years, national regulations concerning sewage discharges into the sea and rivers, which take into account the LBS Protocol and especially its Annex II and whenever appropriate, the common measures already adopted by the Parties	National
By the year 2005, to develop National Plans and Programmes for the environmentally sound Management of Sewage, (NPS), and to this end to ensure: i. By the year 2005, that the coastal cities and urban agglomerations of more than 100.000 inhabitants are connected to a sewer system and dispose all waste water in conformity with a national regulation system ii.To locate coastal outfalls so as to obtain or maintain agreed environmental quality criteria and to avoid exposing shell fisheries, water intakes, and bathing areas to pathogens and to avoid the exposure of sensitive environments (such as lagoons, seagrass beds, etc.) to excess nutrient or suspended solid loads iii. To promote the primary, secondary and, where appropriate and feasible, tertiary treatment of municipal sewage discharged to rivers, estuaries and the sea iv. To promote and control the good operation and proper maintenance of existing facilities v. To promote the reuse of the treated effluents for the conservation of water resources. To this end, infrastructural measures, treatment at source and the segregation of industrial effluents, shall be encouraged, as well as: a) the beneficial reuses of sewage effluents and sludges by the appropriate design of treatment plant and processes and controls of the quality of influent waste waters in accordance with national regulations; b) the environmentally sound treatment when domestic and compatible industrial effluents are treated together; vi) To promote the separate collection of rain waters and municipal waste waters and ensure treatment of first rain waters considered particularly polluting; vii) To identify the availability and sustainability of productive uses of sewage sludge, such as land-spreading, composting, etc. viii) To prohibit the discharge of sludges into water in the Protocol \ Area	National
Industrial waste water Target 1. By the year 2025, to dispose all waste water from industrial installations which are sources of BOD, nutrients and suspended solids, in conformity with the provisions of the LBS Protocol Target 2. Over a period of 10 years, to reduce by 50 % inputs of BOD, nutrients and suspended solids from industrial installations sources of these substances	
To prepare guidelines for the application of BAT and BEP in industrial installations which are sources of BOD, nutrients and suspended solids	Regional
By the year 2010, to formulate and adopt, as appropriate, environmental quality criteria and standards for point source discharges of BOD, nutrients and suspended solids	Regional
By the year 2010, to formulate and adopt guidelines for waste water treatment and waste disposal from industries which are sources of BOD, nutrients and suspended solids	Regional
To reduce discharges of pollutants as much as possible and, in order to do so, to promote the implementation of environmental audits and apply BEP and, if possible, BAT in the industrial installations which are sources of BOD, giving priority to installations located in hot spots	National
To develop National Programmes for the environmentally sound management of waste water and solid waste from industrial installations which are sources of BOD, and to this end to ensure: i) by the year 2005, that at least industrial installations which are sources of BOD, nutrients and suspended solids, located in areas of concern, dispose all waste water in conformity with national regulation system;	National

ii) To locate coastal outfalls so as to obtain or maintain agreed environmental quality criteria and to avoid the exposure of sensitive environments (such as lagoons, seagrass beds, etc.) to excess nutrient or suspended solid loads; iii) To promote primary, secondary and, where appropriate and feasible, tertiary treatment of BOD waste water discharged into rivers, estuaries and the sea; iv) To promote sound operation and proper maintenance of facilities. v) The reduction and beneficial use of waste water or other solutions appropriate to specific sites, such as no-water and low-water solutions; vi) The identification of the availability and sustainability of productive uses of waste water sludge, and other waste, such as land-spreading, composting, energetic uses, animal feed, etc.; vii) To prepare environmental voluntary agreements to which authorities, producers and users are committed on the basis of a reduction plan.	
Agriculture Target : To reduce nutrient inputs, from agriculture and aquaculture practices into areas where these inputs are likely to cause pollution	
To participate in the programmes and activities of international organizations, especially FAO, on sustainable agricultural and rural development in the Mediterranean	Regional
To participate in the FAO programme on the sustainable use of fertilizers and to encourage the preparation of national and regional strategies based on the controlled, appropriate and rational use of seeds, fertilizers and pesticides	Regional
To prepare guidelines for the application of BEP (including good agricultural practices) for the rational use of fertilizers and the reduction of losses of nutrients from agriculture	Regional
To assess the quantities and types of fertilizers used	National
To assess the quantity of solid and liquid manure produced by farm animals	National
To promote the rational use of fertilizers and reduce the losses of nutrients by misuse of inorganic fertilizers and manure	National
To promote ecological agriculture and ecological aquaculture	National
To promote rules of good agricultural practices	National
To participate in the programmes and activities of international organizations, especially FAO, on sustainable agricultural and rural development in the Mediterranean.	National
To promote the implementation of the Convention on Desertification	National
Atmospheric emissions	
No targets or actions set out for atmospheric emissions as concluded that Mediterranean waters are not endangered by the atmospheric deposition of nutrients	

72. In the framework of the SAP/MED and LBS Protocol article 15, two regional Plans relevant to eutrophication were adopted, the Regional Plan on the reduction of BOD5 from urban waste water (2009) and the Regional Plan on the reduction of BOD5 in the food sector (2012), providing for important measures, in specific timelines, including the following:

Table 12. Measures provided for in the Regional Plans for reduction of BOD5

Regional Plan on the reduction of BOD5 from urban waste water	
All agglomerations collect and treat their urban waste waters before discharging them into the environment	2015 -2019
Adoption of National BOD5 ELVs for urban waste waters after treatment (i.e. maximum allowable concentration of BOD5 to be finally discharged from WWTP to the receiving water environment)	2015 -2019
All characteristics of collected and treated urban waste waters are, before discharge in the environment, in accordance to ELVs provisions of the Regional Plan	2015 -2019
Competent authorities or appropriate bodies shall monitor discharges from municipal WWTP to verify compliance with the ELV requirements	2015 -2019
Ensure enforcement of measures	2015 -2019
Regional Plan on the reduction of BOD5 in the food sector	
Reduction of pollution load by application of BEP and BAT Industrial Food Plants from 9 industry sectors which discharge more than 4 000 pe into water bodies shall meet the following requirements (24\ hour values): COD 160 mg/l, TOC 55 mg/l, BOD5 or (BOD7) 30 mg/l	2014
Ensure monitoring of related discharges into water to verify compliance with the requirements and enforcement	2014
Review of the values, on the basis of national reports prepared, taking into account new developments on BAT and BEP and on EQ standards in the region, and considering the possibility to develop ELVs based on contaminant's loads.	2015

c) Gaps and proposals

Gaps related to measures:

73. The following table lists the main issues that need to be further addressed, either by adopting new/updated measures or ensuring better implementation and enforcement of existing measures:

Table 13. Gaps related to measures for eutrophication

Sources	Gaps related to measures
Wastewater	Most of organic pollution from sewage comes results from direct/untreated or inadequately treated discharges[75]: • Despite the existing measure providing for the establishment of WWT systems in all agglomerations, there are many coastal cities without WWTPs, especially in the southern and eastern Mediterranean (see figure 6)[76]. This measure needs to be better implemented at least for the major coastal cities; • At regional level, 21% of treated wastewater (25% for ENP South countries) receives only primary treatment, while only 8% (1% for ENP-South countries) is subject to tertiary treatment[77] → New measures are required to ensure that secondary treatment is undertaken at the majority of WTTP (by setting a specific target) and to promote tertiary treatment (again with a measurable target);

[75] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012
[76] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.
[77] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.

	• Specific measures with quantifiable targets are required to increase the reuse of collected wastewater; • Treatment systems need to be improved based on new technologies, i.e. extraction of nutrients for production of fertilizers, and use of sludge for production of energy; • New measures should provide for application of pretreatment technologies • Revised standards and limits to assess and tackle overcapacity and mal function of WWTP should be adopted
Agriculture	Existing measures at regional level are not sufficient to adequately address the issue. Stricter technical guidelines and management standards, or even Regional Plans are required to tackle inputs from agricultural activities and promote more sustainable farming practices, in line with the provisions under the SCP Action Plan. Some potential measures to be considered are the following: - Better regulation of and restrictions in the use of fertilizers; - Optimized nutrient use; - Incentives for the establishment of more sustainable agriculture farms; - Better management of animal manure[78]; - Promotion of organic and HNV farming, by setting for example a percentage target against total arable land; - Creation of buffer stripes, especially in intensively farmed areas; - Application of water pollution charges for polluting industries, in line with the polluter pays principle.
Aquaculture	Existing measures at regional level are not sufficient to adequately address this sector. Stricter technical guidelines and management standards, or even Regional Plans are required to tackle inputs from aquaculture activities. New measures need to be adopted to ensure that aquaculture activities are adequately planned and developed sustainably and that the environmental impacts are minimized. Nutrient balanced aquaculture needs to be promoted. In this regard, potential new measures for consideration may include[79]: - limitation of site biomass and production levels to a maximum level; - limitation and control of discharges; - limitation of fertilizer use to the real requirements of the site; - use of nutrient enriched water for biogas production or irrigation; - use of efficient feeding systems to ensure minimization of uneaten feed; - implementation of measures to minimize the release of nutrients such as use of closed containment or partial recirculation; - drum filters for clean-up; - development of multi-trophic aquaculture (MTA) systems; - use of blue catch crops (e.g. mussels) as compensation measure; - recirculating aquaculture systems.
Other sources of nutrients	Potential measures for other sources may include[80] - Reductions in atmospheric sources of nitrogen; - Better control of runoff from streets and storm sewers; - Introduction of wetlands as nutrient sinks.
Overall issues	**Gaps related to measures**
Future policy development	The problem of eutrophication is currently spotted mainly in the Northern Mediterranean, where wastewater management is relatively more developed.

[78] http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-5/index_en.htm
[79] European Commission; SWD (2016) 178 final, Commission Staff Working Document – On the application of the Water Framework Directive (WFD) and the Marine Strategy Framework Directive (MSFD) in relation to aquaculture; Brussels 2016
[80] http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-5/index_en.htm

	However, in order to tackle the issue in the long-term, the future conditions in the Southern Mediterranean must be taken into account. According to the Horizon 2020 Mediterranean Report[81], the problem could be expanded in the southern coasts in the future, since population is expected to increase and agricultural and industrial activities to be further developed. Those future scenarios need to be taken into account for the development of regional measures for wastewater treatment
Knowledge/data Monitoring	During the Sub-regional Workshop under ActionMed, stakeholders from the Adriatic countries identified as main gaps on eutrophication the modelling mesoscale, the insufficiency and/or bad design of monitoring programmes and the lack of data/information sharing systems. New measures are needed, providing for the establishment of a bottom-up approach in monitoring, the transboundary cooperation and the development of harmonized indicators/metrics

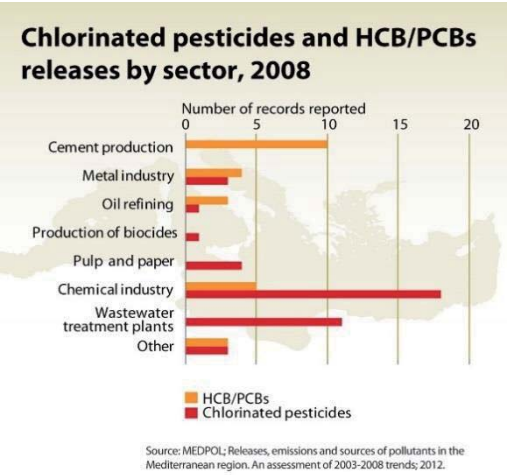
2. Ecological Objective 9 related to contaminants

a) Description of pressures, impacts and drivers

74. The Mediterranean Sea is the largest semi-closed European Sea, receiving relatively large amounts of drainage, while population and economic activities are highly concentrated in coastal areas. The unique characteristics of the Mediterranean Sea make it particularly vulnerable to pollutants from land-based sources, such as oxygen-depleting substances, heavy metals, POPs, hydrocarbons, and nutrients (see chapter 1. Eutrophication).With regards to the sources of this kind of pollution they are mainly land-based, and can be either point-sources (including discharge points, dumping grounds etc.) or nonpoint sources (including fluvial and stormwater run-offs and sewage discharges). Other potential pathways for the introduction of contaminants can be the atmospheric deposition, or sea-based activities (fishing, shipping, offshore activities etc.). [82]

75. The introduction of those contaminants causes significant impacts on marine biodiversity and risks to human health. One priority pollution type for the Mediterranean are **heavy metals** (toxic metals that are persistent and bioaccumulate in human and animal tissues). The most critical heavy metals for the Mediterranean Sea are mercury, cadmium and lead, and their sources include urban and industrial wastewater, fluvial run-offs and atmospheric deposition. Although there are not accurate estimates of the level of toxicity of contaminants, heavy metals adversely affect marine and coastal organisms, even at low levels, by among others lowering their immune system and increasing susceptibility to infections. Their bioaccumulation in tissues poses significant risks also to human health. [83]

[81] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.
[82] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012
[83] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012



76. **Persistent Organic Pollutants (POPs)** are resistant to environmental degradation and therefore persistent, easily transported by wind and water, while they bioaccumulate in tissues and biomagnify in food chains[84]. These characteristics make POPs extremely dangerous for the environment and human health. POPs include chlorinated pesticides, HCB, PCBs, PAHs etc. Exposures to POPs have been linked to *declines, diseases, or abnormalities* of animal species, as they may affect the endocrine and reproductive systems of some species, such as the Mediterranean swordfish. In addition, studies have revealed potential trans-generational impacts in small cetaceans (Abdulla and Linden 2008). With regards to human health, reproductive, developmental, behavioral, neurologic, endocrine, and immunologic health effects have been linked to POPs[85]. [86]

77. **Polycyclic aromatic hydrocarbons (PAH)** and oil pollution are mainly caused by marine transport through activities such as dumping, discharging, bunkering, dry-docking, and discharging of bilge oil (Abdulla and Linden 2008). Aquaculture activities are also responsible for the introduction of PAHs. PAHs have significant impacts on marine organisms, including genetic, cellular, biochemical and physiological.[86]

b) At regional level

78. As already mentioned, marine pollution reduction was the initial focus of MAP since its adoption, as confirmed by the title of the Convention adopted in 1976 "Convention for the Protection of the Mediterranean Sea Against Pollution" and the first Protocols that were adopted in its framework (Dumping, LBS, Emergency).

79. Pollution remains until today a priority issue for MAP – Barcelona Convention and the legal arsenal is now more comprehensive and efficient to address it. With regards to the pressures identified in this chapter (contaminants) there are four Protocols directly applying: **LBS Protocol, Dumping Protocol, Prevention and Emergency Protocol, Hazardous Wastes Protocol**. Furthermore, in 1997, and based on the provisions of the LBS Protocol, the Strategic Action Programme to Address Pollution from Land-Based Activities in the Mediterranean Region **(SAP/MED)** was adopted, identifying priority target categories of substances and activities to control or eliminate them. More specifically the SAP/MED provides for regional activities to be implemented by the Secretariat (MED POL), 33 regional pollution reduction targets relating to municipal sewage, solid waste, and air pollution, and the requirement for the Contracting Parties to develop their **National Action Plans (NAPs),** aiming at integrating SAP/MED objectives and targets into actions at national or local levels, by identifying priority policy, legal, institutional, and pollution reduction targets. The key targets under the SAP/MED, related to contaminants, are presented in the following table:

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[84] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012

[85] https://www.epa.gov/international-cooperation/persistent-organic-pollutants-global-issue-global-response#affect

[86] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012

Table 14. Key contaminants related targets set out in SAP/MED

Sector	Target	Timetable
Municipal sewage	To dispose all municipal waste water (sewage) in conformity with the provisions of the LBS Protocol	2025
	To dispose sewage from cities and urban agglomerations exceeding 100.000 inhabitants and areas of concern in conformity with the provisions of the Protocol	2005
Urban solid waste	To base urban solid waste management on reduction at source, separate collection, recycling, composting and environmentally sound disposal	2025
	To base urban solid waste management on reduction at source, separate collection, recycling, composting and environmentally sound disposal in all cities and urban agglomerations exceeding 100.000 inhabitants and areas of concern	2005
Industrial development	Point source discharges and air emissions into the Protocol Area from industrial installations to be in conformity with the provisions of the Protocol and other agreed international and national provisions	2025
	to reduce by 50 % discharges, emissions and losses of substances that are toxic, persistent and liable to bioaccumulate from industrial installations	2007
	to reduce by 50% discharges, emissions and losses of polluting substances from industrial installations in hot spots and areas of concern	2007
POPs	To phase out inputs of the 9 pesticides and PCBs and reduce to the fullest possible extent inputs of unwanted contaminants: hexachlorobenzene, dioxins and furans	2010
	To reduce 50 % inputs of the priority 12 POPs	2005
	To collect and dispose all PCB waste in a safe and environmentally sound manner	2005
PAHs	To phase out to the fullest possible extent inputs of PAHs	2025
	To reduce by 25 % inputs of PAHs	2010
Heavy metals	To phase out to the fullest possible extent discharges and emissions and losses of heavy metals (mercury, cadmium and lead	2025
	To reduce by 50 % discharges, emissions and losses of heavy metals (mercury, cadmium and lead)	2005
	To reduce by 25 % discharges, emissions and losses of heavy metals (mercury, cadmium and lead)	2000
Organometallic compounds	To phase out to the fullest possible extent discharges, emissions and losses of organomercuric compounds and reduce to the fullest possible extent those of organolead and organotin compounds.	2010
	To reduce by 50 % discharges, emissions and losses of organometallic compound	2010
	To phase out the use of organomercuric compounds	2005
Other heavy metals	To eliminate to the fullest possible extent pollution of the Mediterranean Sea caused by discharges, emissions and losses of zinc, copper and chrome	
	To reduce discharges, emissions and losses of zinc, copper and chrome	2010
Organohalogen compounds	To eliminate to the fullest possible extent pollution of the Mediterranean Sea caused by discharges, emissions and losses of organohalogen compounds	
	To reduce discharges, emissions and losses into the Mediterranean Sea of organohalogen compounds.	2010

Radioactive Substances	To eliminate to the fullest possible extent inputs of radioactive substances	
Industrial wastewater	To dispose all waste water from industrial installations which are sources of BOD, nutrients and suspended solids, in conformity with the provisions of the LBS Protocol	2025
	To reduce by 50 % inputs of BOD, nutrients and suspended solids from industrial installations sources of these substances	2007
Agriculture	To reduce nutrient inputs, from agriculture and aquaculture practices into areas where these inputs are likely to cause pollution.	
Hazardous wastes	To dispose all hazardous wastes in a safe and environmentally sound manner and in conformity with the provisions of the LBS Protocol and other international agreed provisions	2025
	To reduce as far as possible by 20 % the generation of hazardous waste from industrial installations	2007
	To dispose 50 % of the hazardous waste generated, in a safe and environmentally sound manner and in conformity with the provisions of the LBS Protocol and other internationally agreed provisions	2010
Obsolete chemicals	To collect and dispose all obsolete chemicals in a safe and environmentally sound manner.	2005
Used lubricating oil (luboil)	To collect and dispose 50 % of used lubricating oil in a safe and environmentally sound manner	2005
Batteries	To dispose all used batteries in a safe and environmentally sound manner and in conformity with the provisions of the Protocol and other internationally agreed provisions	2025
	To reduce by 20 % the generation of used batteries	2007
	To dispose 50 % of used batteries in a safe and environmentally sound manner and in conformity with the provisions of the Protocol and other agreed international provisions	2010

80. In line with the provisions under the SAP/MED and in the framework of the article 15 of the LBS Protocol, the Contracting Parties adopted a series of **Regional Pans** aiming at pollution prevention and reduction:

- Regional Plan on the reduction of inputs of Mercury in the framework of the implementation of Article 15 of the LBS Protocol (2012)
- Regional Plan on the reduction of BOD5 in the food sector (2012)
- Regional Plan on the phasing out of Hexabromodiphenyl ether, Hetabromodiphenyl ether, Tetrabromodiphenyl ether, and Pentabromodiphenil ether in the framework of the implementation of Article 15 of the LBS Protocol (2012)
- Regional Plan on the on the phasing out of lindane and endosulfane in the framework of the implementation of Article 15 of the LBS Protocol (2012)
- Regional Plan on the phasing out of perfluorooctane solfonic acid, its salts, and perfluorooctane sulfonyl fluoride in the framework of the implementation of Article 15 of the LBS Protocol (2012)
- Regional Plan on the elimination of Alpha hexachlorocyclohexane, Betahexachlorocyclohexane, Chlordecone, Hexabromobiphenyl, and Pentachlorobenzene in the framework of the implementation of Article 15 of the LBS Protocol (2012)
- Regional Plan on the Phasing Out of DDT in the framework of the implementation of Article 15 of the LBS Protocol (2009)

- Regional Plan on the reduction of BOD5 from urban waste water in the framework of the implementation of Article 15 of the LBS Protocol (2009)
- Regional Plan on the elimination of Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Mirex, and Toxaphene in the framework of the implementation of Article 15 of the LBS Protocol (2009)

Table 15. Key measures provided for in pollution-related Regional Plans

Measures	Timetable	Problem addressed
All agglomerations collect and treat their urban waste waters before discharging them into the environment	2015 - 2019	BOD5 in urban WW
Adoption of National BOD5 ELVs for urban waste waters after treatment (i.e. maximum allowable concentration of BOD5 to be finally discharged from WWTP to the receiving water environment)	2015 - 2019	BOD5 in urban WW
All characteristics of collected and treated urban waste waters are, before discharge in the environment, in accordance to ELVs provisions of the Regional Plan	2015 - 2019	BOD5 in urban WW
Competent authorities or appropriate bodies shall monitor discharges from municipal WWTP to verify compliance with the ELV requirements	2015 - 2019	BOD5 in urban WW
Ensure enforcement of measures	2015 - 2019	BOD5 in urban WW
The Parties shall prohibit and/or take legal and administrative measures necessary to eliminate the production and use of 7 substances. Imports and exports are only permitted for the purpose of environmentally sound disposal	2011 – 2012	Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Mirex and Toxaphene
The Parties shall take appropriate measures so that such wastes, including products and articles upon becoming wastes are (a) handled, collected, transported and stored in an environmentally sound manner; (b) disposed of in such a way that the persistent organic pollutant content is destroyed or irreversibly transformed so that they do not exhibit the characteristics of persistent organic pollutants or otherwise disposed of in an environmentally sound manner when destruction or irreversible transformation does not represent the environmentally preferable option or the persistent organic pollutant content is low, taking into account international rules, standards, and guidelines, and relevant global and regional regimes governing the management of hazardous wastes and the Basel Convention; (c) not permitted to be subjected to disposal operations that may lead to recovery, recycling, reclamation, direct reuse or alternative uses of persistent organic pollutants; and (d) not transported across international boundaries without taking into account relevant international rules, standards and guidelines.	2011 – 2012	Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Mirex and Toxaphene
Application of BAT and BEPs for environmentally sound management of POPs	2011 – 2012	Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Mirex and Toxaphene
The Parties shall prohibit and/or take legal and administrative measures necessary to Eliminate the production and use of DDT. Imports and exports are only permitted for the purpose of environmentally sound disposal and for emergency situations for disease vector control	2011 – 2012	DDT

The Parties shall take appropriate measures so that DDT wastes, including products and articles upon becoming wastes are (a) handled, collected, transported and stored in an environmentally sound manner; (b) disposed of in such a way that the persistent organic pollutant content is destroyed or irreversibly transformed so that they do not exhibit the characteristics of persistent organic pollutants or otherwise disposed of in an environmentally sound manner when destruction or irreversible transformation does not represent the environmentally preferable option or the persistent organic pollutant content is low, taking into account international rules, standards, and guidelines, and relevant global and regional regimes governing the management of hazardous wastes; (c) not permitted to be subjected to disposal operations that may lead to recovery, recycling, reclamation, direct reuse or alternative uses of persistent organic pollutants; and (d) not transported across international boundaries without taking into account relevant international rules, standards and guidelines.	2011 - 2012	DDT
Application of BAT and BEPs for environmentally sound management of POPs	2011 – 2012	DDT
The parties shall prohibit the installation of new Chlor alkali plants using mercury cells with immediate effect.		Mercury from Chlor Alkali industry
The parties shall prohibit the installation of vinyl chloride monomer production plants using mercury as a catalyst with immediate effect		Mercury from Chlor Alkali industry
The parties shall ensure that the releases of mercury from the activity of Chlor alkali plants shall cease by 2020 at the latest and i) that the environmentally sound management of metallic mercury from the decommissioned plants is achieved, including the prohibition of its re-entry into the market. ii) that the total releases of mercury (to the air, the water and to the products) from existing Chlor alkali plants are progressively reduced until their final cessation with the view not to exceed 1.0g per metric tonne of installed chlorine production capacity in each plant. In doing so, the air missions should not exceed 0.9g per metric tonne of installed chlorineproduction capacity in each plant.	2020	Mercury emissions from Chlor Alkali industry
The Parties shall adopt by 2015 and 2019 National ELVs for Mercury emissions according to the provisions of the Regional Plan	2015 - 2019	Mercury emissions from non Chlor Alkali industry
The Parties shall adopt National ELVs for Mercury emissions from incineration plants (Waste gas 0.05 mg/ Nm3)	2015 - 2019	Mercury emissions from non Chlor Alkali industry
The Parties shall take the appropriate measures to reduce the inputs of Mercury emissions from other sectors and use alternatives as appropriate.	2015 - 2019	Mercury emissions from non Chlor Alkali industry
The Parties shall take the appropriate measures to isolate and contain the mercury containing wastes to avoid potential contamination of air, soil or water	2015 - 2019	Mercury emissions from non Chlor Alkali industry
The Parties shall identify existing sites which have been historically contaminated with mercury including at least the old mines and decommissioned Chlor alkali plants, and take, with regard to these sites, environmentally sound management measures such as safety works, use restrictions or decontamination	2015 - 2019	Mercury emissions from non Chlor Alkali industry

The Parties shall neither open new mines nor re-open old mercury mining sites	2015 - 2019	Mercury emissions from non Chlor Alkali industry
Reduction of pollution load by application of BEP and BAT Industrial Food Plants from 9 industry sectors which discharge more than 4 000 pe into water bodies shall meet the following requirements (24\ hour values): COD 160 mg/l, TOC 55 mg/l, BOD5 or (BOD7) 30 mg/l	2014	BOD5 in the Food sector
Ensure monitoring of related discharges into water to verify compliance with the requirements and enforcement	2014	BOD5 in the Food sector
Review of the values, on the basis of national reports prepared, taking into account new developments on BAT and BEP and on EQ standards in the region, and considering the possibility to develop ELVs based on contaminant's loads.	2015	BOD5 in the Food sector
• The Parties shall prohibit and/or take legal and administrative measures necessary to eliminate production and use of the chemicals. • Imports and exports are only permitted for the purpose of their environmentally sound disposal and under specific conditions, in accordance with the relevant international rules, standards and regulations. • The Parties shall take appropriate measures so that wastes, including products and articles upon becoming wastes are (a) handled, collected, transported and stored in an environmentally sound manner; (b) disposed of in such a way that the persistent organic pollutant content is destroyed or irreversibly transformed so that they do not exhibit the characteristics of persistent organic pollutants or otherwise disposed of in an environmentally sound manner when destruction or irreversible transformation does not represent the environmentally preferable option or the persistent organic pollutant content is low, taking into account international rules, standards, and guidelines, and relevant global and regional regimes governing the management of hazardous wastes; (c) not permitted to be subjected to disposal operations that may lead to recovery, recycling, reclamation, direct reuse or alternative uses of persistent organic pollutants; and (d) not transported across international boundaries without taking into account relevant international rules, standards and guidelines. • The Contracting Parties shall endeavor to apply BEPs for environmentally sound management • The Parties should identify to the extent practicable stock piles consisting of or containing these chemicals and report to the Secretariat	2013	Alpha hexachlorocyclohexane; Beta hexachlorocyclohexane; Hexabromobiphenyl; Chlordecone; Pentachlorobenzene; Tetrabromodiphenyl ether and Pentabromodiphenyl ether; Hexabromodiphenyl ether and Heptabromodiphenyl ether; Lindane; Endosulfan, Perfluorooctane sulfonic acid, its salts and perfluorooactane sulfonyl fluoride
• The production and use of Perfluorooctane sulfonic acid (PFOS), its salts and Perfluorooctane sulfonyl fluoride (PFOSF) shall be eliminated by all Parties except as provided in Appendix A of the RP • Parties that produce and/or use these chemicals shall take into account, as appropriate, guidance such as that given in the relevant parts of the general guidance on best available techniques and best environmental practices given in Appendix B of the RP • Every two years each Party that uses and/or produces these chemicals shall report on progress made to eliminate PFOS, its salts and PFOSF	2013	Perfluorooctane sulfonic acid, its salts and perfluorooactane sulfonyl fluoride

• With the goal of reducing and ultimately eliminating the production and/or use of these chemicals, the Contracting Parties shall encourage: - action to phase out uses when suitable alternatives substances or methods are available; - research on and development of safe alternative chemical and non-chemical products and processes, methods and strategies - Synergy with the work carried out under the Stockholm convention		
Each Party shall at a minimum take measures to reduce the total releases derived from anthropogenic releases of Pentachlorobenzene, with the goal of their continuing minimization and, where feasible, ultimate elimination in accordance with the obligations of the Stockholm Convention taking into consideration the Guidelines on BAT and BEP and new progresses on this issue developed within the framework of the mentioned Convention.	2013	Alpha hexachlorocyclohexane, Beta hexachlorocyclohexane, Chlordecone, Hexabromobiphenil ,Pentachlorobenzen

81. In the framework of the Protocol concerning Cooperation in Preventing Pollution from Ships and, in Cases of Emergency, Combating Pollution of the Mediterranean Sea, **the Regional Strategy for Prevention of and Response to Marine Pollution from Ships** was adopted by the COP14, while a revised Strategy for the period 2016-2021 was adopted in 2016 by the COP19. The overarching objectives of the revised Regional Strategy are prevention of pollution from ships; prevention of maritime accidents; and preparation for response to major pollution incident. The Operational objectives are broken down to Specific objectives and associated goals, and some of them can have a direct effect in preventing/reducing pollution, such as:

- To strengthen the Memorandum of Understanding (MoU) on port State control (PSC) in the Mediterranean region (Mediterranean MoU);
- To ensure the provision of appropriate port reception facilities;
- Delivery of ship-generated wastes;
- Improved follow-up of pollution events as well as monitoring and surveillance of illicit discharges;
- To improve the level of enforcement and the prosecution of discharge offenders;
- To reduce the pollution generated by pleasure craft activities;
- To establish procedures for the designation of places of refuge in order to minimize the risks of widespread pollution;
- To ensure that adequate emergency towing capacity is available throughout the Mediterranean to assist vessels, including tankers, in distress;
- To enhance the levels of pre-positioned spill response equipment under the direct control of Mediterranean coastal States;
- To improve the quality, speed and effectiveness of decision-making process in case of marine pollution incidents through the development and introduction of technical and decision support tools;
- To increase as much as practical, the level of knowledge in the field of preparedness and response to accidental marine pollution by oil and other harmful substances;
- To revise the existing recommendations, principles and guidelines, and to develop new ones aimed at facilitating international cooperation and mutual assistance within the framework of the 2002 Prevention and Emergency Protocol;
- To strengthen the capacity of individual coastal States to respond efficiently to marine pollution incidents through development of sub-regional operational agreements and contingency plans.

82. Finally the **Offshore Action Plan**, which was adopted by the COP19 in 2016, for the implementation of the Offshore Protocol, also sets out relevant provisions. It has as its general

objective to define measures which, if applied at regional level and by each Contracting Party within their jurisdiction will ensure the safety of offshore activities and reduce their potential impact on the marine environment and its ecosystem.

83. Despite the comprehensive regulatory framework developed at regional level to combat pollution, there are still important issues present in this area, which can be grouped under the following categories:

Knowledge/data gaps

- A lot of progress has been made at regional level, on data collection and we have a good knowledge of the situation. However there are short time series and differences in sampling conditions that don't allow for robust trend analysis of the available data (MAP MED POL 2011) while data availability on oil discharges is very limited[87];
- Reporting under MED POL is not at annual basis[88];
- Monitoring activities across the region lack harmonization;
- Monitoring and reporting is particularly problematic in the area of wastewater management. According to the H2020 Mediterranean Report, wastewater that remains uncollected is currently not accounted for[89].

Insufficient implementation/enforcement of legislation

- The amendments of the Dumping Protocol are not yet in force;
- The Offshore Protocol has entered into force, but it is still ratified by a minority of Contracting Parties;
- Enforcement of environmental legislation on marine pollution is in general weak especially in the ENP-South countries;
- MARPOL Convention has been ratified by a big number of Contracting Parties. However gaps are identified with regards to the establishment of coherent legal frameworks for its implementation[90];
- According to the assessment of pollution data conducted by Gomez-Gutierrez et al. 2007, POPs have declined. However this decline is more evident for DDTs than for PCBs, which should, according to the SoER-MED[91], be alarming as an indicator of possible ongoing inputs. Moreover, in areas where trend analysis can be carried out, PCB concentrations in biota are relatively constant or even slightly increased (northwestern and eastern Mediterranean).[92]

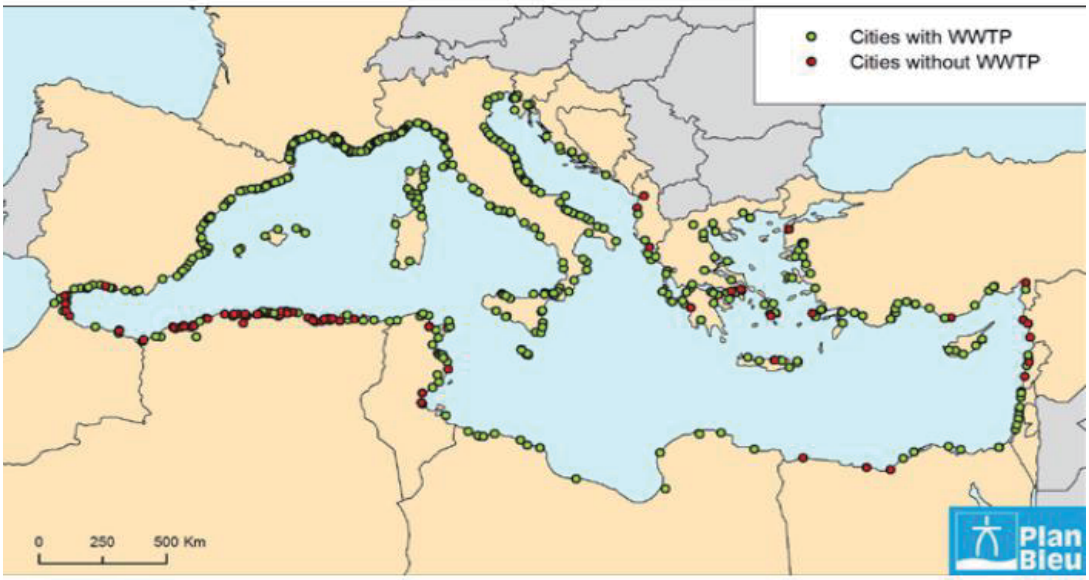
Waste and wastewater management gaps

- There is still 21% of wastewater quantity (25% in ENP South Countries) that undergo only primary treatment, while the percentage of wastewater quantity undergoing tertiary treatment is

[87] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012
[88] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.
[89] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.
[90] UNEP/MAP, 2015. Draft Ecosystem Approach based Measures Gap Analysis. UNEP(DEPI)/MED WG.420/5
[91] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012
[92] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012

very low (8% at regional level), especially in the ENP South Countries (only 1%) (MAP MED POL, 2011)[93];

- In ENP South Countries 58% of the collected municipal solid waste is disposed in open dumps[94];
- There are insufficient accounting and cost-recovery mechanisms in most of the countries regarding wastewater and solid waste management[95];
- According to the H2020 Mediterranean Report[96], in most ENP South Mediterranean countries municipal solid waste management has the following gaps that need to be addressed: i. weak legislation, ii. No waste reduction policies, iii. Lack of separate collection, iv. Lack of knowledge, v. Strong regional disparities between urban and rural areas, vi. Lack of data;
- There are gaps in stormwater management, with very limited use of green infrastructure and nature based solutions;
- Despite the existing measure providing for the establishment of WWT systems in all agglomerations, there are many coastal cities without WWTPs, especially in the southern and eastern Mediterranean (see figure 6)[97];
- There are important sectors contributing to pollution from contaminants that are not adequately regulated at regional level, including desalination, agriculture, aquaculture and tanneries[98];
- A general upward trend for mercury and lead has been identified in the period between 1998 and 2012[99].



Source: Bbased on MAP Technical Report Series No 157, 2004; UNEP/MAP, 2011 UNEP(DEPI)/MED WG.357/Inf.7

Figure 6. Overview of the major coastal cities with/without WWTPs in 2010 (Source: Horizon 2020 Mediterranean Report, EEA, 2014)

[93] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.
[94] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.
[95] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.
[96] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.
[97] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.
[98] UNEP/MAP, 2015. Draft Ecosystem Approach based Measures Gap Analysis. UNEP(DEPI)/MED WG.420/5
[99] State of Europe's seas, European Environment Agency, 2015

Planning

- The urban population growth projections are not fully taken into account;
- Although set out as a waste management objective under the MSSD the decoupling of municipal waste generation from economic growth was not achieved in many Contracting Parties[100];
- New technologies must be further promoted in the region, including cleaner production and material light-weighting, and the introduction of new waste utilization technologies, such as biogas production (SEEP-NET);
- The depollution gap, anticipated by the UfM Secretariat *(difference between the pollution that will be produced in 2025 and the pollution and flows that will be treated by the facilities that are already in place or are planned with secured funding)*[101] is not adequately addressed and reflected in the MAP framework to combat pollution.

c) Gaps and proposals

84. The following table lists the environmental pressures and overall aspects for which there are not efficient measures adopted at regional level, or the existing measures are not adequately implemented.

Table 16. Gaps related to measures for contaminants

Priority sources and pressures	Gaps related to measures
Wastewater	• Existing measures set out in the Regional Plans for municipal and industrial wastewater treatment need to be fully implemented; • Control and inspections in industrial facilities should be enhanced (e.g. control over the emptying of cesspits, particularly in hotels and industrial facilities); • New measures should promote the application of enhanced treatment and management systems and the use of new technologies; • Revised standards and limits to assess and tackle overcapacity and mal function of WWTP should be adopted.
Stormwater	Measures are needed to promote separate collection of stormwater and enhance the use of Green Infrastructure and nature-based solutions for stormwater management
Oil discharges	Our knowledge and data are very limited in this area. New measures should be considered to enhance the data collection, through the use of new technologies
Dumping	The Dumping Protocol is not yet in force. • The ratification of the Protocol by all Contracting Parties should be supported; • Full alignment of all Dumping Protocol Annexes and Guidelines with the international legislation (London Protocol) should be achieved.
Offshore activities	Despite its entry into force, the Protocol is ratified only by a few Parties. According also to the objectives of the Offshore Action Plan, the number of ratifications has to increase.
Atmospheric deposition	Atmospheric deposition of contaminants should be further addressed at regional level, as source of marine pollution.
POPs	• There is a general downward trend in DDT and PCBs, following the adoption of the Regional Plans. However the decline is more evident for

[100] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.
[101] http://ufmsecretariat.org/wp-content/uploads/2014/06/FinalReport-Reduced_file_size.pdf

	DDT than PCB, which may indicate an ongoing input → stricter implementation and enforcement of measures for the elimination of PCB is required; • Enforcement of the existing measures to ensure that all new installations apply BAT and BEPs for environmentally sound management of POPs.
Mercury and lead	An upward trend for both contaminants has been observed over the period 1998-2012[102]; There is need for full implementation of measures for the elimination of mercury inputs and the adoption of strict measures for lead inputs as well as assessment of the need for new measures.
Emerging contaminants	The list of priority contaminants should be reviewed and updated, to take into account "emerging pollutants", i.e. pharmaceuticals, nano-materials etc.
Other sources of contaminants	Stricter technical guidelines and management standards, or, if need be, regional plans on sectors contributing to marine pollution such as agriculture, aquaculture, tanneries and desalination should be considered.
Overall issues	**Gaps related to measures**
Reporting	• It should be made annually in the framework of MED POL; • A Regional PRTR should be established; • New measures are required for improved monitoring /reporting of wastewater, in order to fully account for uncollected wastewater.
Depollution	• New measures should provide for decontamination and restoration of degraded sites (i.e. as part of a restoration target of 15% of all degraded ecosystems); • New measures should promote the accounting of depollution/degradation cost, as part of the ecosystem services assessment.
Legislation enforcement	Enforcement of environmental legislation needs to be strengthened, through better permission, control and prosecution mechanisms, reform of sanctions to be more dissuasive and facilitated access to justice.
Implementation of MARPOL	Support should be provided for the development of harmonised legal frameworks at national levels for the implementation of the Convention by all the countries that have ratified MARPOL.

3. Ecological Objective 10 related to marine litter

a) Description of pressures, impacts and drivers

85. Marine litter is one of the most critical issues, oceans are facing today, causing serious impacts on the marine and coastal environment and biodiversity and also hindering human activities. It is estimated that every year oceans receive six million tons of debris, with plastics being the most abundant marine litter type[103]. According to the Joint Group of Experts on the Scientific Aspects of Marine Environmental Pollution (GESAMP) 80% of marine litter entering the seas originate from land-based sources. The international community is highly concerned about this emerging issue and the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities identifies marine litter as one of the 8 key contaminants for which action is required at international level[104]. In that view, the Manila Declaration, which was adopted in 2012 highlights

[102] State of Europe's seas, European Environment Agency, 2015
[103] http://www.perseus-net.eu/site/content.php?locale=1&sel=517&artid=565
[104] UNEP(OCA)/LBA/IG.2/7, 5 December 1995

marine litter as a priority source category for the period 2012-2016, while the Honolulu Commitment and the Honolulu Strategy are key-steps in combating marine litter on international level.

86. With regards to the situation in the Mediterranean basin, it is considered as one of the most affected areas by marine litter and thus, marine litter has been an issue of concern since the first years of MAP. According to the Marine Litter Assessment in the Mediterranean[105], cigarette butts is by far the most commonly found type of marine litter in the Mediterranean **beaches**; with regards to **floating litter**, plastics are the most prevailing type, accounting even for 95-100% of total wastes in some areas; plastics is an equally important type of litter also on the **sea floor** (62.7% +/- 5.47). The figures coming to light from different surveys are alarming: 19.6 cigarette filters per volunteer in Mediterranean beaches in 2013 (with a global average of 3.66 cigarette filters per volunteer in 2006), evaluated number of more than 62 million macro-litter items floating in the Mediterranean, evaluation of 0.5 billion items lying on the Mediterranean Sea floor[106]. On top of the traditional marine litter types, particular importance is currently paid both at international and regional levels on the emerging issues of microplastics and nanoplastics as well as on the distribution and impacts of the abandoned, lost or discarded fishing gears (ALDFG).

87. With regard to the sources of marine litter, the traditional classification distinguishes between land-based and sea-based sources, with LBS accounting for around 80% or marine litter. The concentration of population in coastal areas, along with the high number of tourists during the summer period, and the inappropriate waste management in some areas, make the Mediterranean Sea even more vulnerable to marine litter from land-based sources. According to a recent study (Jambeck et al. 2015) the population of Mediterranean coasts produces 360,939 tons of waste every day, of which 36,560 is plastic, while 20% of plastic waste is inadequately managed (7,451 tons)[107]. According to some predictions, plastic waste dumping may be increased by a factor of 2.17 between 2010 and 2025 in the Mediterranean, if no management measures are applied[108]. Land-based sources of marine litter include households, tourist facilities, municipal dumps, riverine run-offs, uncontrolled discharges, improper disposals etc. while sea-based sources include shipping, and pleasure crafts, commercial and recreational fishing, offshore activities, mariculture etc. A prioritization of sources, based on their significance can be found in the Figure 7 (MAP BP/RAC, 2009).

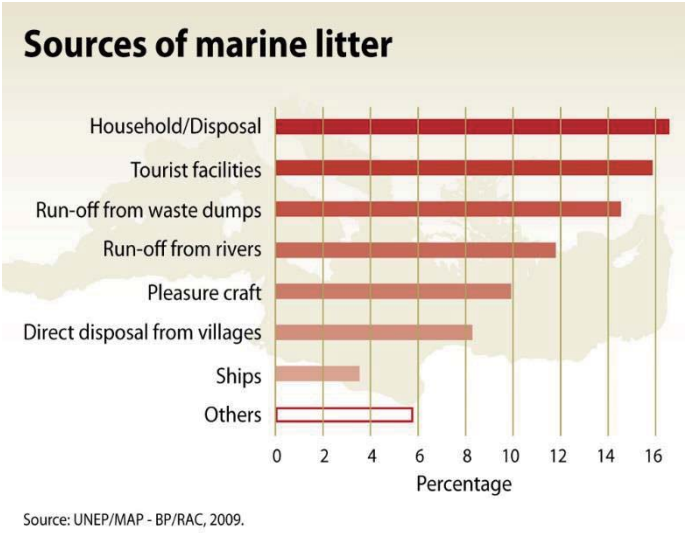


Figure 7. Sources of Marine Litter (Source: UN Environment/MAP –BP/RAC, 2009)

88. The 2015 Marine Litter Assessment in the Mediterranean[109] suggests the division of general sources to use-categories sources including recreational, shipping, fishing, sewage-related, tourist, sanitary and medical litter, in order to

[105] Marine Litter Assessment in the Mediterranean, UNEP/MAP, Athens, 2015
[106] Marine Litter Assessment in the Mediterranean, UNEP/MAP, Athens, 2015
[107] Marine Litter Assessment in the Mediterranean, UNEP/MAP, Athens, 2015
[108] Marine Litter Assessment in the Mediterranean, UNEP/MAP, Athens, 2015
[109] Marine Litter Assessment in the Mediterranean, UNEP/MAP, Athens, 2015

facilitate the establishment of targets and reduction measures. Smoking-related activities can be a separate source, since marine litter from smoking related activities accounts for 40% of marine litter (mainly on beaches), based on data collected in the framework of the International Coastal Clean-up (ICC) campaigns. According to different studies, recreational activities and tourism account for more than half of the marine litter in the Mediterranean.

89. Although the impacts of marine litter have not been clearly defined and evaluated, it is generally accepted that there are significant adverse impacts on marine ecosystems, while human health and economic activities may also be affected. Several studies have found that ingested microplastics can potentially disrupt cellular processes and degrade tissue[110] , while toxins are accumulating and may be transferred across the food chain, leading to a biomagnification effect[111].[112] The following table, listing the main impacts of marine litter, is developed according to the Marine Litter Assessment in the Mediterranean, UN Environment/MAP, 2015[113]. However for many of those impacts there are still uncertainties that need to be further explored.

Table 17. Main impacts of marine litter (Original source Marine Litter Assessment in the Mediterranean, UN Environment/MAP, 2015[107])

Sector	Impacts	Comments
Wildlife	Entanglement	Birds (35%), fish (27%), invertebrates (20%), mammals (13%)
	Ingestion	>180 marine species documented as having absorbed plastic debris (Van Franeker et al.2011) – mainly seabirds, fish and marine mammals. Sub-lethal effects on population levels are not fully investigated.
	Impacts of ghost gear on benthic habitats	Potential damages to the benthic habitats or impacts on the distribution of benthic species
	Transport of invasive species	More than 80% of the known alien species in the Mediterranean might have been introduced or further expanded due to marine litter (CIESM, 2014)
	Biodiversity alterations as a result of increased habitat heterogeneity	
Human health	Injuries to beach users	
	Entanglement risks for swimmers and divers	
	Potential biohazards	
	Impacts of microplastics and nanoplastics	Not sufficiently assessed – uncertainties exist
	Delivery of pathogens to fish	Impacts on human health need to be further assessed
Secondary pollution	Plastic additives can leach out of the matrix over time, and exert toxic and endocrine disruptive effects on marine organisms when	

[110] Rochman et al. 2013
[111] Wright et al., 2013
[112] UNEP, 2016 Marine Litter Legislation: A Toolkit for Policymakers
[113] Marine Litter Assessment in the Mediterranean, UNEP/MAP, Athens, 2015

	plastic are ingested (Oehlmann et al.2009)	
	Transfer or enhanced bioaccumulation of POPs	
	Potential leaching of phthalates	
	Increased concern for persistent, bioaccumulative and toxic (PBT)chemicals absorbed into plastics, becoming vectors for the bioaccumulation of these highly toxic pollutants in fatty tissues (Rochman et al. 2013)	
Economic impacts*	Municipalities	Health risks Disposal Beach cleaning Negative publicity
	Tourism	Negative publicity Area promotion Reduced revenue Reduces recreational opportunities Loss of aesthetic amenity
	Fishing	Repairing damage to fishing gear Replacement of lost gear Reduced and/or contaminated catch
	NGOs	Operational costs Financial assistance Volunteers' time
Social impacts	Loss of jobs because of the economic impacts	
	Decrease of aesthetic value	

* only the impacts with moderate to high importance for the Mediterranean were derived from the Marine Litter Assessment in the Mediterranean, UN Environment/MAP, 2015 (original information Mouat et al. 2010).

b) At regional level

90. As already mentioned, marine litter has been an issue of high concern for MAP since its first years. The LBS Protocol to the Barcelona Convention that was adopted in 1980 acknowledges the importance of marine litter problem, and provides a first definition of marine litter in Annex I. In 1991 MAP published a Bibliography on marine litter, including 440 references and an assessment of the state in the Mediterranean. In 1996 the amended LBS Protocol was adopted and included marine litter in the list of priority substances that require the development of action plans. The Strategic Action Plan on LBS pollution (SAP/MED) specifically addresses the issue of marine litter and based on this Plan, MED POL prepared Guidelines for Management of Coastal Litter for the Mediterranean Region (MAP MED POL, 2004). A new assessment of the status of marine litter was conducted in 2008, serving as the basis for the preparation of a Strategic Framework for the management of marine litter which was finally adopted by COP17 in 2012. Furthermore, the COP17 mandated the Secretariat to prepare a Regional Action Plan on Marine Litter, in the framework of the Article 15 of the LBS Protocol to the Barcelona Convention.

91. The Regional Plan on Marine Litter Management in the Mediterranean (MLRP) was adopted in 2013 by the COP18, making MAP a pioneer in combating marine litter at regional level, since it

was the first Regional Sea Convention to adopt legally binding measures and timelines regarding the prevention and reduction of marine litter. The main objectives of the MLRP are the prevention of generation of marine litter, the reduction to the minimum of marine litter pollution and its impacts on ecosystem services, the removal of existent marine litter, the enhancement of knowledge on marine litter, and the management of marine litter in accordance with accepted international standards. The main operational targets set out in the Regional Action Plan include the integration of marine litter measures into the National Action Plans (NAP), the adoption of appropriate legislation and/or establishment of adequate institutional arrangements for efficient marine litter prevention and reduction, the adoption of specific measures for the prevention of marine litter from land-based and sea-based sources, the removal of existing marine litter by ensuring its environmentally sound disposal, the assessment of the state of marine litter in the Mediterranean, the development of a Mediterranean marine litter monitoring programme, and the enhancement of public awareness and participation.

92. More specifically the MLRP sets out concrete measures in specific timelines, as presented in the table below, which also includes a column regarding the main pressure/problem addressed by each measure:

Table 18. Measures provided for in the Regional Plan on Marine Litter Management in the Mediterranean

Measures	Timetable	Issue addressed
Update the existing LBS National Action Plan guidelines	2014	Implementation at national level
Update the existing LBS National Action Plans to integrate marine litter measures in accordance with the provisions of the Regional Plan	2015	Implementation at national level
Development of reporting format	2014	Implementation/reporting
National reports on the implementation of the Regional Plan	biennially	Compliance/reporting
To base urban solid waste management on reduction at source, separate collection, recycling, composting of the organic fraction and environmentally sound disposal (SAP-MED)	2025	Solid waste management and disposal Waste mitigation hierarchy
Implement adequate waste reducing/reusing/ recycling measures in order to reduce the fraction of plastic packaging waste that goes to landfill or incineration	2017 [2019]	Plastics: Packaging waste
Prevention measures related to Extended Producer Responsibility strategy by making the producers, manufacturer brand owners and first importers responsible for the entire life-cycle of the product with measures prioritizing the hierarchy of waste management in order to encourage companies to design products for reuse, recycling and materials reduction in weight and toxicity	2017	Recycling rates Polluter Pays Principle Sustainable production Prevention of generation Waste mitigation hierarchy
Prevention measures related to Sustainable Procurement Policies contributing to the promotion of the consumption of recycled plastic-made products	2017	Plastics Recycling Consumption patterns
Prevention measures related to establishment of voluntary agreements with retailers and supermarkets to set an objective of reduction of plastic bags consumption and/or establishment of plastic bag taxes	2017	Plastics: bags Consumption patterns
Prevention measures related to establishment of mandatory Deposits, Return and Restoration System for expandable polystyrene boxes in the fishing sector	2017	Plastics: polystyrene boxes

		Litter from sea-based sources
Prevention measures related to establishment of mandatory Deposits, Return and Restoration System for beverage packaging prioritizing when possible their reuse	2017	Recycling: beverage packaging Consumption Patterns
Take necessary measures to establish adequate urban sewer, wastewater treatment plants and waste management systems to prevent run-off and riverine inputs of litter	2020 [2025]	Waste/Wastewater management
In accordance with Article 14 of the Prevention and Emergency Protocol explore and implement to the extent possible ways and means to charge reasonable cost for the use of port reception facilities or when applicable, apply No-Special-Fee system and take the necessary steps to provide ships using their ports with updated information relevant to the obligation arising from Annex V of MARPOL Convention and from their legislation applicable in the field	2017	Pollution from ships Port reception
"Fishing for Litter" system, in consultation with the competent international and regional organizations, to facilitate clean-up of the floating litter and the seabed from marine litter caught incidentally and/or generated by fishing vessels in their regular activities including derelict fishing gears	2017	Clean up (floating and seabed) Stakeholders engagement ALDFG
"Gear marking to indicate ownership" concept and "reduced ghost catches through the use of environmentally neutral upon degradation of nets, pots and traps concept", in consultation with the competent international and regional organizations in the fishing sector	2017	ALDFG Mitigation measures
Apply necessary measures to prevent any marine littering from dredging activities in accordance with the relevant guidelines adopted in the framework of Dumping Protocol of the Barcelona Convention	2017	Dumping: Dredging material
Take the necessary measures to close the existing illegal dump sites in the geographical area of the Regional Plan	2020	Illegal dumping Enforcement-Compliance
Sanction illegal dumping in accordance with national legislation including littering on the beach, illegal sewage disposal in the coastal zone and rivers in the area of the application of the Regional Plan in accordance with national legislation	2017	Illegal dumping Legislation gaps Enforcement-Compliance
Identify in collaboration with relevant stakeholders accumulations / hotspots of marine litter and implement compulsory national programmes on their regular removal and sound disposal	2017 [2019]	Hotspots Removal Public participation Clean-up campaigns
Implement National Marine Litter Cleanup Campaigns on regular basis	2017 [2019]	Removal
Participate in International Coastal Cleanup Campaigns and Programmes	2017 [2019]	Removal International cooperation
Apply as appropriate Adopt-a-Beach or similar practices and enhance public participation role with regards to marine litter management	2017 [2019]	Removal Public Participation Awareness raising
Apply Fishing for Litter practices, in consultation with the competent international and regional organizations and in partnership with fishermen and ensure adequate collection, sorting and environmentally sound disposal of the fished litter	2017 [2019]	Removal Stakeholder engagement

Charge reasonable costs for the use of port reception facilities or, when applicable apply No-Special-Fee system, in consultation with competent international and regional organizations when using port reception facilities for implementing the measures provided for in Article 10.	2017 [2019]	Pollution from ships Port reception facilities
Assessment of the state of marine litter in the Mediterranean	Every 6 years	Knowledge – data gaps State of marine litter
Establishment of an Expert Group on Regional Marine Litter Monitoring Programme	2014	Knowledge – data gaps Monitoring
Guidelines for the preparation of the National Marine Litter Monitoring Programmes, in collaboration with the relevant regional organizations	2014	Knowledge – data gaps Monitoring
Preparation of the Regional Marine Litter Monitoring Programme, as part of the integrated regional monitoring programme	2014 [2015]	Knowledge – data gaps Monitoring
For the purpose of the Regional Plan and in compliance with the monitoring obligations under Article 12 of the Barcelona Convention and Article 8 of the LBS Protocol design in cooperation with the Secretariat National Monitoring Programme on Marine Litter	2015 [2017]	Knowledge – data gaps Monitoring
Report, in accordance with Article 13 of the LBS Protocol, on the implementation of the National Marine Litter Monitoring Programme	Biennially	Monitoring Compliance/Reporting
Establishment of the Regional Data Bank on Marine Litter	2016	Knowledge – data gaps Marine Litter data bank
While implementing measures provided for in Articles 9 and 10 of the Regional Plan enhance knowledge and collect information on the state of the marine litter		Knowledge – data gaps State of marine litter

93. It is clear that very important instruments have been adopted at regional level to prevent the generation of marine litter and also to reduce the existing litter. According to the 2015 Marine Litter Assessment in the Mediterranean and other assessments and studies, significant progress has been achieved in addressing the issue of marine litter, however the situation remains critical and in some cases it is even deteriorating. The priority issues of concern on the problem of marine litter are mainly associated with the lack of knowledge and data, the need for more efficient prevention and reduction measures, the inadequate management, and weak implementation of relevant environmental principles:

Knowledge and data[114] [115]

- Data collection has been improved across the region, however it lacks consistency and harmonization, with more data in the Northern Mediterranean[114];
- For the moment, the main impacts on marine organisms for which scientific certainty exists are linked to entanglement, ingestion, colonization and rafting[114]. More research is needed on the sub-lethal effects of marine litter ingestion on species populations, as well as the potential for secondary pollution;
- Our knowledge is still very limited regarding microplastics and especially their potential impacts on biodiversity and human health. The gaps in knowledge are even bigger when it comes to nanoplastics, which, may have even greater impacts on marine ecosystems;
- There is insufficient knowledge on litter colonization and transport dynamics[114];

[114] Marine Litter Assessment in the Mediterranean, UNEP/MAP, Athens, 2015
[115] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012

- There is need for more research and improved knowledge on the degradation process of litter (especially plastics) and the leachability of pollutants[114];
- The socio-economic impacts of marine litter are not fully assessed and understood, especially regarding the specific economic activities that are among the most impacted, such as tourism, fishing and aquaculture;
- There is a limited knowledge on marine litter in the deep sea environments (over 500m)[114].

Prevention/reduction

- Although smoking related activities in general are one of the most important sources of marine litter in the Mediterranean, especially compared to the global average, and cigarette butts the most commonly found litter on beaches, there are no targeted measures to ensure their prevention/reduction;
- Single-use plastic bags are one of the most important marine litter items. There is only one measure in the MLRP specifically aiming at the reduction of plastic bags. The problem of single-use plastic bags is still persistent;
- Microplastics are not addressed in the MLRP;
- Existing measures are not sufficient to prevent/reduce the use of microplastics (microbeads) in Personal Care and Cosmetic Products (PCCP)[116];
- Electronic waste and medical waste are not specifically addressed in the MLRP;
- Tourism is not adequately addressed at regional level as one of the main sectors responsible for generation of marine litter.

Management

- The percentage of inadequately managed waste remains very high in some countries, mainly the Contracting Parties that are not EU Member States, even more than 60% in some cases (Jambeck et al. 2015)[117];
- In ENP South Countries 58% of the collected municipal solid waste is disposed in open dumps, despite the existing measures[118];
- Port reception facilities still don't operate optimally, especially regarding small harbors and marinas;
- Less than 10% of the waste collected in the Mediterranean region is currently recycled[119];
- A regional survey prepared by MAP and MIO ECSDE in 2015, revealed some important gaps, relating to ALDFG including i. insufficient facilities for effective management of fishing gear and other marine litter collected on board, ii. Weak implementation and/or enforcement of the relevant legislation, iii. Worsening of the derelict fishing gear impacts on biodiversity;
- The circular economy concept is not fully integrated and implemented in the framework of the marine litter policies in the Mediterranean;
- Links to human health are not sufficiently addressed;

Implementation of environmental principles

- Awareness and public participation are relatively weak with regards to solid waste management in many Contracting Parties;

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[116] Eunomia for European Commission DG Environment 2016, Study to support the development of measures to combat a range of marine litter sources, Chris Serrington, Chiarrina Darah, Simon Hann, George Cole, Mark Corbin

[117] Marine Litter Assessment in the Mediterranean, UNEP/MAP, Athens, 2015

[118] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.

[119] http://www.eea.europa.eu/soer-2015/countries/mediterranean

- There has been a significant decrease in public participation in the cleaning campaigns (70% decrease of volunteers between 2002-2013)[120];
- The polluter pays principle is not sufficiently integrated in the Mediterranean policies to combat marine litter;
- The precautionary principle is not sufficiently applied, in areas where scientific uncertainties exist, such as for nanoplastics, or human health risks.

c) Gaps and proposals

94. The following table lists the main environmental pressures and overall issues related to marine litter for which there are not sufficient measures in the MLRP, or the existing measures provided for are not adequately implemented

Table 19. Gaps related to measures for marine litter

Keu items and pressures	Gap related to measures
Plastics	Better implementation and enforcement of the existing measures for prevention and reduction of plastics is required, especially regarding the reduction of packaging waste fraction that goes to landfill/incineration, reduction of plastic bag consumption, establishment of plastic bag taxes, deposit –return-restoration systems for polystyrene fishing boxes. In addition new specific measures should be considered to more efficiently address the problem of plastics, including : • Consideration of single-use plastic bag ban or imposition of tax; • Banning of plastics landfilling; • Requirements on the thickness of plastic bags; • Replacement of plastics by bioplastics where feasible (substance made from organic biomass sources, like vegetable oils, starches etc.)[121]; • Adoption of specific recycling targets for plastics; • Development and testing of new technologies for plastic litter removal; • Prevention of generation of single use plastics, mainly through the promotion of sustainable consumption patterns and substitution of some plastic items with more easily reusable material; • Specific reduction targets for food and beverage packaging and obligation for minimum packaging weight and volume[122]; • Enhancement of separate waste collection for plastics.
Microplastics	• Microplastics and even more nanoplastics are not adequately addressed in the MLRP. There is need for specific measures to tackle this emerging problem, including [123]: - Adoption of a common definition of microplastics; - Adoption of a common sampling methodology; - Measures aiming at reducing the number of microplastics (under specific targets), focusing on the prevention of their generation; - Differentiated measures for primary and secondary microplastics;

[120] Marine Litter Assessment in the Mediterranean, UNEP/MAP, Athens, 2015
[121] http://whatis.techtarget.com/definition/bioplastic
[122] UNEP (2016) Marine Litter Legislation: A Toolkit for Policymakers
[123] Eunomia for European Commission DG Environment 2016, Study to support the development of measures to combat a range of marine litter sources, Chris Serrington, Chiarrina Darah, Simon Hann, George Cole, Mark Corbin

	- Improvement of WWTP systems to cover this issue; - Prohibition or adoption of best management practices of nurdles (pre-production plastic)[124]. • New measures should be adopted to support reduction/phasing out of microbeads in personal care and cosmetic products (PCCPs), mainly aiming at replacing microplastics with more environmentally friendly alternatives[125]. A prohibition of manufacture of microbeads can also be considered, as practiced by several States globally[126].
Cigarette butts	New/additional measures are required for prevention and reduction of marine litter from smoking-related activities on beach, including: • reduction targets for cigarette butts; • cigarette bans on beaches (USA, UK, Canada)127; • adequate facilities in organized beaches; • more clean-up activities; • signs on beaches; • awareness raising measures; • promotion of sustainable consumption.
E-waste	Electronic wastes are not specifically addressed in the Regional Plan. New measures are required to ensure the operation of electronic waste management system according to EMS &BAT.
Medical waste	They are not covered by the MLRP. New measures are required for prevention, reduction and integrated management of this type of waste
ALDFG	This type of marine litter is covered by measures under the MLRP. However, stronger implementation is needed, including: • Training and awareness raising of the fishing sector; • More Fishing for Litter projects; • Mechanisms to minimize impacts and facilitate removal, such as use of biodegradable components, marking gear, and attaching it to structures to enable retrieval[128] or the repeal of the prohibition on removal carried out by persons other than the legal owner of ALDFG (Honolulu Strategy); • Partnerships between fishermen and business sector for the reuse/recycling of collected fishing nets.
Solid waste management	• Existing measures providing for adequate treatment of collected wastes and closure of illegal dump sites should be fully implemented and enforced; Additional measures to be considered should promote full cost recovery for solid waste management, enhance municipalities' role and capacity in waste management, ensure full restoration of contaminated sites and regular monitoring to control the environmental state of the site etc.
Pollution from ships	• This type of pollution is addressed by the MLRP but better implementation of the provided measures is required (port reception facilities, No-Special-Fee, MARPOL Annex V). The existing measures should better address:

[124] UNEP (2016) Marine Litter Legislation: A Toolkit for Policymakers
Cal.Water Code §13367: http://www.leginfo.ca.gov/cgi-bin/displaycode?section=wat&group=13001-14000&file=13367
[125] UNEP (2016). Marine plastic debris and microplastics – Global lessons and research to inspire action and guide policy change. United Nations Environment Programme, Nairobi
[126] UNEP (2016) Marine Litter Legislation: A Toolkit for Policymakers
[127] UNEP (2016) Marine Litter Legislation: A Toolkit for Policymakers
[128] UNEP (2016) Marine Litter Legislation: A Toolkit for Policymakers

	- Port reception facilities in small harbors and marinas; - Better enforcement of the waste discharge prohibition and stricter sanctions; - Improvement of inspection framework.
Overall issues	**Gaps related to measures**
Knowledge gaps	The existing measures aiming at addressing the issue of lack of knowledge and data, are general. New measures are required to enhance our knowledge on specific issues[129] including: • Microplastics (numbers, and impacts); • Nanoplastics (numbers and impacts); • ALDFG (numbers and impacts); • Sub-lethal effects of marine litter ingestion; • Secondary pollution; • Colonization of floating marine litter; • Transport dynamics and accumulation; • Degradation and leachability; • Socio-economic impacts; • State of deep seas; • Effectiveness of new-technologies for monitoring and removal.
Monitoring	Integrated and comprehensive monitoring is required, that can be achieved through implementation of the EcAp Integrated Monitoring and Assessment Programme (IMAP). New technologies should be developed and used for monitoring of marine litter, including remote sensing, low-altitude visual flights, unmanned aircraft systems (UAS), drones, ROVs, gliders etc.
Pollution reduction targets	Quantifiable targets need to be included in the MLRP for priority litter items including: cigarette butts, food packaging, plastic bottles, caps, straws, grocery plastic bags, glass bottles, other bags (plastic and paper), and cans (based on results from the ICC 2014)[130]. According to MARLISCO project (Poitou and Poulain, 2015) the most promising measures for marine litter reduction include: deposit systems for bottles, public awareness raising, collection at processing of marine litter at sea by fishermen, development of litter collection in rain sewers, optimization of waste collection systems, tax for plastic producers etc. [131]
Polluter-Pays Principle	There are many measures aimed to apply the polluter-pays principle, but in practice it is not fully achieved. Stronger implementation and enforcement are required, to address the costs of depollution. Measures may include: • enhancement of Extended Producers Responsibility; • internalization of depollution costs; • support of businesses' environmental responsibility, with integration of marine litter into the environmental responsibility reports; • establishment and enforcement of dissuasive penalties for people who drop litter and strong sanctions for big polluters.
Prevention	• Existing measures aiming at prevention of generation of litter at source are not efficient. New/updated measures are required to ensure prevention at source, including: • shift to more sustainable production patterns (links with SCP);

[129] Marine Litter Assessment in the Mediterranean, UNEP/MAP, Athens, 2015
[130] Marine Litter Assessment in the Mediterranean, UNEP/MAP, Athens, 2015
[131] Marine Litter Assessment in the Mediterranean, UNEP/MAP, Athens, 2015

	• adoption and implementation of a Circular Economy Strategy at regional level; • promotion of eco-design and smart production; • extended producers responsibility measures; • increased reuse and recycling, including strengthening the separation of waste at source, and selective collection; • development and strengthening of Best Management Practices to eliminate abandonment of vessels and loss of cargo, solid waste and gear (Honolulu Strategy); • enhanced role and capacities of municipalities for waste management.
Removal	• Better implementation of existing measures should be achieved including: • Enhanced participation in clean up campaigns; • More and targeted cleaning activities (e.g. along riverbanks); • Stronger implementation of Fishing for Litter initiatives.
Socioeconomic impacts	• The links and impacts with economic activities (tourism, fishing etc.) and human health should be better addressed in the MLRP. • Also the value of degradation/cost of depollution should be better assessed, in the framework of an ecosystem services assessment process132.
Categorization of measures	Measures and targets should be categorized by use-categories sources, which are more specific than the traditional land/sea-based distinction. The following categories can be considered: - recreational litter (smoking related activities included); - shipping litter; - fishing litter; - sewage-related debris; - tourist litter; - sanitary and medical litter.
Economic instruments	According to the information provided in the Marine Litter Assessment in the Mediterranean (after Oosterhuis et al., 2014) the most cost-effective measures are: • Taxes on plastic bags; • Direct Payment awards (fishing gear, bottles (to fishermen) etc.). Another instruments that can be considered are the landfill tax[133].

[132] According to the UNEP (2016) Marine Litter Legislation: A Toolkit for Policymakers, the Asia-Pacific region is reported to lose US$1.265 billion annually due to damage to its fishing, shipping, and marine tourism industries caused by marine litter while marine litter costs Scotland at least US$24.3 million annually

[133] The Scottish Landfill Tax was introduced in April 2015 in the framework of the Scotland's Zero Waste Plan (2010)

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Annex I

GFCM Recommendations on conservation and management measures as appeared in the FAO 2016 Report [134]

[134] The State of Mediterranean and Black Sea Fisheries, FAO 2016

Type of measure	Recommendation	Details	Scope		
			Fishery	Species / habitats	Areas / countries
Spatial management	GFCM/29/2005/1	Prohibits the use of towed dredge and trawler fisheries at depths greater than 1 000 m	Towed dredges and bottom trawl	Deep water benthic habitats and species.	Mediterranean and Black Sea
	GFCM/30/2006/3	Establishes three FRAs in order to protect deep sea sensitive habitats from bottom fisheries	Towed dredges and bottom trawl	Deep water corals and other invertebrate communities	Lophelia reef off Capo Santa Maria di Leuca (GSA 19, Italy); the Nile Delta area cold hydrocarbon seeps (GSA 26, Egypt); the Eratosthenes Seamount (GSA 25, Cyprus)
	GFCM/33/2009/1	Freezes the fishing effort applied to demersal stocks in the FRA, which shall not exceed the level of fishing effort applied in 2008, and makes other provisions	Towed nets, bottom and mid-water longlines, bottom-set nets	Demersal species	Gulf of Lion (GSA 07, France)
	GFCM/36/3012/3	Prohibits fishing activities with trawl nets within 3 nautical miles of the coast	Bottom and pelagic trawling	Coastal sharks and rays	Mediterranean and Black Sea
Mitigation measures for the incidental catch of vulnerable species	GFCM/2005/3(A) [3]	Prohibits the use of driftnets larger than 2.5 km in the GFCM area	Driftnet	Large marine vertebrates, including pelagic sharks, cetaceans, sea turtles and seabirds.	Mediterranean and Black Sea
	GFCM34/2010/4 (C)	Prohibits retaining on board, transhipping, landing, storing, selling or offering for sale any part or whole carcass of bigeye thresher sharks *(Alopias superciliosus)* in any fishery	Any tuna fisheries regulated by ICCAT (including longline and purse seine)	Bigeye thresher sharks *(Alopias superciliosus)*	Mediterranean Sea
	GFCM/35/2011/7 (C)	Prohibits retaining on board, transhipping, landing, storing, selling or offering for sale any part or whole carcass of hammerhead sharks (except for *S. tiburo*), except for developing countries under certain circumstances	Any tuna fisheries regulated by ICCAT (including longline and purse seine)	Hammerhead sharks, with exception of *S. tiburo*.	Mediterranean Sea
	GFCM/36/2012/3	Prohibits finning, fishing of species listed in Annex II of SPA/ BD Protocol as well as trawl fishing in coastal areas	All types of fisheries.	Sharks and rays	Mediterranean and Black Sea
	GFCM/35/2011/3	Requires the implementation of measures to ensure that incidental taking of seabirds is monitored, recorded and kept to the lowest level possible	All types of fisheries	Seabirds	Mediterranean and Black Sea

	GFCM/35/2011/4	Requires the implementation of measures to ensure that incidental taking of sea turtles is monitored, recorded and kept to the lowest level possible	All types of fisheries. Specific provisions for purse seine, surrounding nets, longline and bottom-set nets	Sea turtles	Mediterranean and Black Sea
	GFCM/35/2011/5	Requires the implementation of measures to monitor and mitigate the risk of incidental taking of monk seals during fishing operations	All types of fisheries	Monk seal	Mediterranean Sea
	GFCM/36/2012/2	Requires the implementation of actions to study, monitor, prevent, mitigate and, to the extent possible, eliminate incidental taking of cetaceans during fishing operations	All types of fisheries. Specific provisions for gillnet fisheries	Cetaceans	Mediterranean and Black Sea

Type of measure	Recommendation	Details	Scope		
			Fishery	Species / habitats	Areas / countries
	GFCM/37/2013/2	Requires the implementation of actions to study, monitor, prevent, mitigate and, to the extent possible, eliminate incidental taking of cetaceans during fishing operations. Other provisions regarding management measures for turbot	Bottom gillnet fisheries	Cetaceans, turbot	Black Sea
Other technical conservation measures	GFCM/30/2006/2	Establishes closed season for dolphin fish fisheries with FAD from 1 January to 14 August	Dolphin fish fisheries using FAD	Dolphin fish	Mediterranean and Black Sea
	GFCM/33/2009/2	Requires the adoption of a minimum 40 mm square mesh codend or a diamond mesh size of at least 50 mm	Demersal trawling	Demersal species	Mediterranean and Black Sea
	GFCM/35/2011/2	Prohibits the use of towed gear and ROV for red coral harvesting. Prohibits harvesting of coral below 50 m depth	Red coral harvesting	Red coral	Mediterranean Sea
	GFCM/36/2012/1	Prohibits harvesting red coral colonies whose basal diameter is less than 7 mm	Red coral harvesting	Red coral	Mediterranean Sea