UNITED NATIONS

EP

UNEP(DEPI)/MED WG.426/Inf.3

UNITED NATIONS
ENVIRONMENT PROGRAMME
MEDITERRANEAN ACTION PLAN

5 October 2016
Original: English

Regional Meeting on NAPs Implementation – Lessons learned and the way forward

Marseille, France, 17-18 October 2016

Agenda item 5: Potential new/updated measures to achieve GES on pollution and litter

Regional Gap Analysis of Programmes of Measures related to pollution and litter

D r a f t

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

The meeting has been organized in collaboration with the EU-funded Regional Project "SWIM and Horizon 2020 Support Mechanism"

SWIM and Horizon 2020 Support Mechanism

Project funded by the European Union

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I. Introduction and context

I.i. 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 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 EUR in terms of production value and 4,2 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, so-called SoER-MED[4], are coastal degradation and sprawl, chemical contamination, eutrophication, marine litter, marine noise, invasive alien species, overexploitation of fish stocks, deterioration of sea floor integrity, changes in hydrographic conditions and biodiversity loss. 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 UNEP/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;

[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

- Climate change impact.

I.ii. UNEP/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 UNEP. 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 arsenal 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), a series of Regional Plans on pollution, biodiversity, Integrated Coastal Zone Management, Sustainable Consumption and Production etc., as well as the Mediterranean Strategy on Sustainable Development (MSSD).

5. Furthermore, The Ecosystem Approach (EcAp) is the overarching principle of UNEP/MAP with the ultimate aim of identifying and achieving the GES of the Mediterranean Sea. It was first adopted by the Contracting Parties in COP15, while in COP17 the Contracting Parties recognized the ecosystem approach as a guiding principle for the overall work under the Barcelona Convention and adopted the ecosystem approach Roadmap (Decision IG.20/4). The Ecosystem Approach, which is in line with the provisions under the MSFD, 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 Barcelona Convention, in order to reach GES.

6. The revised Mediterranean Strategy for Sustainable Development (2016-2025) was adopted by the COP19 in 2016[5], setting the following targets and timetables:

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

Deadline	Target
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

[5] Decision IG.22/2

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

I.iii. Marine Strategy Framework Directive (MSFD)

7. The MSFD was adopted by the EU in 2008 in order to respond in an integrated manner to the multiple pressures faced by the European Seas. The Directive explicitly introduces, in its article 1, an ecosystem-based approach to the management of human activities, moving from a sectorial to an integrated protection of the marine environment. The central objective set out in the MSFD is to achieve a Good Environmental Status (GES) of all EU Seas by 2020, which is defined as "*The environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive*". In order to better define the GES , eleven descriptors are set out in the Directive's Annex I, covering all the different aspects of marine and coastal ecosystems, that need to be addressed : biodiversity, non-indigenous species, populations of commercial fish species, food webs, eutrophication, sea floor integrity, hydrographical conditions, contaminants, contaminants in seafood, marine litter, energy and underwater noise.

8. According to the provisions of the MSFD, the Member States have to develop their Marine Strategies, by following five main steps[6]:

Milestone	Deadline
Assessment of the current environmental status of national marine waters and impacts and socio-economic analysis of human activities (Initial Assessment)	2012
Determination of what GES means for each country	2012
Definition of environmental targets and associated indicators required to achieve GES by 2020	2012
Establishment of monitoring programmes	2014
Development of programmes of measures (PoM) to achieve or maintain GES by 2020	2015

9. An important element of the MSFD is that it introduces an adaptive management, meaning that the Marine Strategies must be periodically reviewed and updated every six years. This approach offers the member States the opportunity to assess the gaps in each step, and therefore strengthen the efficient elements and change the weak points of their Strategies.

[6] http://ec.europa.eu/environment/marine/eu-coast-and-marine-policy/implementation/index_en.htm

10. The Directive defines the EU marine regions and subregions and requires that Member States take into account the fact that marine waters covered by their sovereignty or jurisdiction form an integral part of a marine region, for the development of their Marine Strategies. Therefore, cooperation and coordination at regional level is a precondition of successful implementation of the Directive and at this point, the role of the Regional Seas Conventions is crucial.

11. In view of supporting the implementation of the MSFD, a coordination Programme, called **Common Implementation Strategy (CIS),** was established at EU level. CIS works at three levels, as follows: Three **Working Groups**, consisting of experts have been set up in order to provide information and support the implementation of the MSFD in the areas of GES definition for all the descriptors, socioeconomic analysis, and data and knowledge exchange, while two technical groups are providing advice and guidance for marine noise and marine litter focusing on the issues of methodologies for monitoring and assessment and the establishment of targets. The work undertaken by the Working Groups is guided by the **Marine Strategy Coordination Group (MSCG)**, which steers the process and feeds the main outcomes into the **Marine Directors Meetings** which is the high-level political group of the CIS, aiming at ensuring the overall implementation of the MSFD. Important outcomes have been delivered by the CIS that have supported the implementation of the MSFD, such as the Reports for the definition and assessment of all the descriptors, or the Report on Monitoring and others[7].

I.iv ActionMed Project

12. It is of crucial importance for the Mediterranean States to implement both the MSFD (for the EU Member States) and the EcAp under the Barcelona Convention in an adequate and coherent manner. A full and harmonized implementation will not only benefit the marine and coastal environment, by reaching a Good Environmental Status but it will also provide socio-economic stability by ensuring the sustainable continuation of the different activities taking place in the Mediterranean basin.

13. In this regard, the EU funded ActionMed Project, aims mainly to support and improve the implementation of the MSFD cycle across the Mediterranean focusing on the needs of its five steps in close collaboration with the Regional Sea Convention in the Mediterranean (UNEP/MAP) and its Ecosystem Approach. The project will review the initial assessment, the GES definition and the environmental target setting in 2018, with emphasis on biodiversity, will develop integrated and coordinated and financially sustainable Regional Action Plans (short, mid-term and long-term and best practices for monitoring programmes), and programmes of measures, test their implementation and finally support the establishment of an information Management System to fill data gaps for Mediterranean marine waters.

14. As part of the ActionMed Project, a Regional PoM Analysis (D3.1) has been undertaken with the objective 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 assess their efficiency and to finally identify the gaps related to measures, meaning the capacity of measures to bridge the gap between the GES and the current situation. In the cases where existing measures are not sufficient to tackle an identified environmental problem, the report highlights the need for adoption of new measures, by proposing for some cases potential measures to be considered. The Regional PoM Analysis covers the majority of environmental pressures, including pollution (eutrophication, contaminants, marine litter), biodiversity loss, non-indigenous species, depletion of commercially exploited fish stocks, damage to sea-floor integrity, as well as cross-cutting issues (climate change, unsustainable consumption and production patterns, impacts of coastal development). The

[7] https://circabc.europa.eu/faces/jsp/extension/wai/navigation/container.jsp

geographical scope of this analysis is not limited to the Mediterranean EU Member States but covers all the Contracting Parties to the Barcelona Convention.

I.v. Present Report

15. The present document builds on the findings of the Regional PoM Analysis, and focuses on pollution-related issues. The following table provides an overview of the main environmental problems and the relevant regional legislation to address them:

Table 2. Main pollution issues and relevant regional legislation and Programmes of Measures

Pressure	Relevant regional legislation and programmes of measures
Eutrophication	LBS Protocol SAP/MED Regional Plans on BOD5
Contaminants	LBS Protocol Dumping Protocol HZ Protocol Offshore Protocol & Action Plan SAP/MED Regional Plans Regional Strategy on pollution from ships
Marine Litter	LBS Protocol SAP/MED Regional Plan on Marine Litter Management in the Mediterranean

I.vi. Measures

16. According to the Initial Measures Gap Analysis of UNEP/MAP[8] which is in line with the MSFD, *measures cover management measures undertaken on a common regional basis and where appropriate, with specific time limits for completion, with the overall aim of achieving the good environmental status of the Mediterranean coast and sea.* According to the MSFD Annex VI, those measures may consist of input controls, output controls, spatial and temporal distribution controls, management coordination measures, measures to improve traceability, economic incentives, mitigation and remediation tools, or communication, stakeholder involvement and awareness raising measures[9].

17. The measures required to achieve the GES can be either new or existing measures that have already been adopted in the framework of other policies, such as for example pollution reduction and control measures. In the case of existing measures, what needs to be examined is if those measures are fully implemented and if they are sufficient to bridge the gap between GES and the current situation. If the measures are inadequately implemented, more incentives, support or better enforcement and/or

[8] UNEP/MAP, 2015. Draft Ecosystem Approach based Measures Gap Analysis. UNEP(DEPI)/MED WG.420/5
[9] Directive 2008/56/EC, Annex VI

compliance mechanisms are required. In case of insufficient measures these have to be replaced or complemented by new measures.

18. It is important to note that there is a considerable number of existing measures that continue to apply as they are relevant to the achievement of GES, as provided for under the MSFD and the Barcelona Convention COP decisions. However 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. For example the Natura 2000 network (or the MPAs at regional level) is one of the existing tools that will be used to achieve GES, under the biodiversity descriptor/ecological objective, but it will be coordinated with measures under other policies, such as the fisheries measures, the measures for control and eradication of the IAS etc., since the different activities will be managed in an integrated manner aiming at achieving GES.

19. The measures for the achievement of GES at EU level will be included in the Programmes of Measures that are developed by the Member States, by taking into account the regional conditions and needs. This set of measures has to be implemented and put into context with each other by the Member States, referring to the environmental targets they address[10]. Almost all the EU countries have prepared or are currently preparing their Programmes of Measures.

20. In the framework of UNEP/MAP, measures have been adopted both at regional and national levels. The present study focuses on the regional measures in the area of pollution prevention and reduction, which can be found in the SAP/MED, the Regional Plans for priority contaminants, the Regional Plan on Marine Litter Management in the Mediterranean, the Regional Strategy for prevention of and response to marine pollution from ship, the Offshore Action Plan etc. The measures adopted at regional level have to be transposed by the Contracting Parties and their implementation is assessed by the Compliance Committee, on the basis of the Reports provided by the Contracting Parties, according to the article 26 of the Barcelona Convention.

21. With regards to pollution combat and control at national level, the Contracting Parties are requested to develop their National Action Plans (NAPs) in line with the provisions of the LBS Protocol, the SAP/MED, and the Regional Action Plans. The first National Action Plans were adopted by the Contracting Parties in 2003-2005 and they are now revised and updated, in order to take into account the new regional measures as well as the advancements in the framework of the Ecosystem Approach. The NAPs include measures relevant to the Ecological Objectives 5, 8 and 9 (eutrophication, contaminants and marine litter) and they need to be streamlined with the Programmes of Measures under the MSFD in the respective areas (descriptors 5, 8, 9, and 10 –eutrophication, contaminants, contaminants in seafood, marine litter).

I.vii. Methodology

22. For each of these issues, the analysis has been conducted following a homogenous methodology and systematic approach:

- Definition of main pressures on the Mediterranean sea and coast
- Assessment of their impacts and sources
- Identification of the existing measures at regional level
- Review of the main gaps
- Identification of areas where problems are already addressed by existing measures, but better implementation is required

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

- Identification of problems that are not sufficiently tackled by existing measures and for which additional measures are needed
- Proposal of measures to be considered for the areas that are inadequately addressed in the current framework
- Prioritization of required measures based on status of GES

I.viii. Summary of main findings

23. Below is presented a summary of the findings for the main issues considered in this study:

24. **Eutrophication**: Although the Mediterranean Sea is in its biggest part oligotrophic, there are important eutrophication hotspots caused by human induced nutrient overenrichment. The sectors with the greater contribution to eutrophication are farming, wastewater treatment and industry. Eutrophication is tackled indirectly by different regional instruments, but there are still some areas where further actions are required:

- Improvement of WWT mechanisms: promotion of secondary and tertiary treatment, increased reuse of collected wastewater, operation of WWTP in all major coastal cities, integration of future scenarios regarding population increase and activities expansion in ENPI South countries in the Programmes of Measures
- Adoption of new measures for agriculture, including restrictions in fertilisers use, optimised nutrient use, promotion of sustainable and organic farming, wider use of EFAs to combat eutrophication, use of EU CAP Pillar II for dark green measures, permanent grasslands, buffer strips etc.
- Adoption of technical guidelines and management standards for aquaculture activities
- Adoption of measures to prevent nutrient inputs from other sources (reduction of atmospheric depositions, better control of runoffs, introduction of wetlands as nutrient sinks etc.)

25. **Contaminants,** including organic matter, heavy metals, POPs and PAH, has been a priority issue for UNEP/MAP since the first years of its adoption. The regional legal arsenal to tackle this problem includes Protocols (mainly the LBS, Dumping, Offshore and Hazardous Wastes Protocols), a Strategic Action Programme (SAP/MED) and a series of Regional Plans including measures and timetables for priority contaminants. The main findings on measures needed to address the gaps for contaminants are summarised as follows:

- Improvement of WWT systems: better implementation of the measure for establishment of WWTP in all major coastal cities and promotion of secondary and tertiary treatment
- Improvement of solid waste management
- Stricter implementation and enforcement of measures aiming to eliminate some key contaminants that continue to be present in the Mediterranean
- Obligation for more frequent reporting
- Adoption of measures to promote Green Infrastructure and nature-based solutions for stormwater management, as well as decoupling of waste generation from economic growth
- Review and update of priority contaminants
- Adoption of new measures or even Regional Plans for sectors contributing to pollution, including agriculture, aquaculture, desalination and tanneries
- Upscale ratifications of both the Dumping (not yet in force) and Offshore Protocols
- Adoption of new measures to better address the atmospheric deposition of contaminants

26. **Marine litter** in the Mediterranean has been confirmed as a critical issue and UNEP/MAP was the first ever Regional Sea Programme to adopt a Regional Plan on Marine Litter Management in the Mediterranean (hereinafter referred to as MLRP), setting out legally binding measures and timetables for marine litter management. Although significant progress has been achieved in

controlling, preventing and reducing marine litter, there are still gaps that need to be addressed, mainly through:

- Better research, and monitoring and assessment programmes (through IMAP)
- Stronger implementation and enforcement of existing measures and adoption of new measures to reduce plastics
- Adoption of new measures to address the emerging issues of microplastics and nanoplastics
- Adoption of measures specifically addressing the issue of cigarette butts
- Better implementation of existing measures and adoption of new measures for pollution from ships
- Establishment of quantifiable reduction targets for priority items
- Better implementation and enforcement of preventive measures set out in the MLRP
- Integration of circular economy measures in the MLRP
- Better identification and more detailed categorization of marine litter sources

II. Eutrophication

II.i. Description of pressures, impacts and drivers

27. Although nutrients are essential for productive marine environments, their overload may cause the effect of eutrophication with negative impacts for marine and coastal environment. The situation is not the same in every part 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 swage, agricultural run-off and organic chemical and fertilizer industry[11] (see figure 1 below, original sources SoER-MED, 2012). Eutrophication in the Mediterranean is therefore mostly limited to coastal areas and areas with restricted water exchange with the open sea[12].

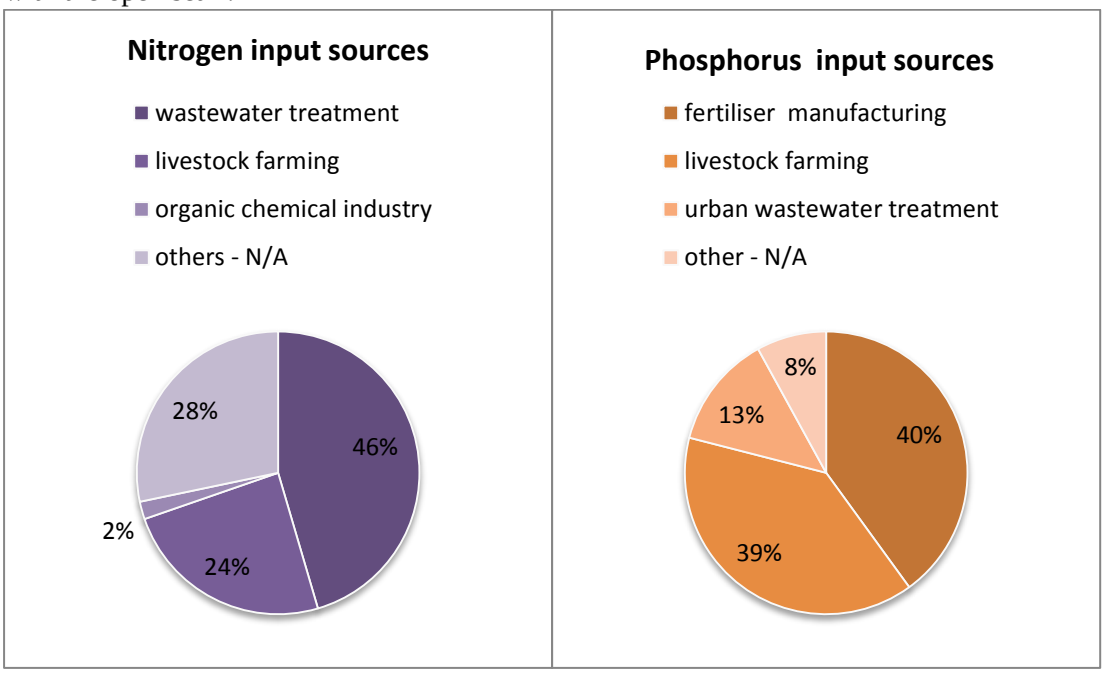


Figure 1. Nutrient input sources (Source: SoER-MED, UNEP/MAP 2012)[13]

28. 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 (UNEP/MAP MED POL, 2012)[14].

29. 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.[15] The most important impacts of eutrophication is the development of algal blooms

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

and red tides. In large concentrations algal blooms can produce biotoxins, with high risks to marine organisms and human health, and significant socioeconomic impacts[16].

30. 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. Long-term impacts on sea grass meadows from the creation of bacterial mats in anoxic zones have also been identified.[17]

31. 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.

II.ii. Existing measures at regional level

32. 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.

33. 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 3. 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
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

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

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; 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,	National

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	

34. 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 4. 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

II.iii. Gaps and proposals

35. The following table lists the main issues that need to be further addressed wither by adopting new/updated measures or by ensuring better implementation of existing measures.

Table 5. Gaps related to measures for eutrophication

Sources	Gaps related to measures
Wastewater	• 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 4)[18]. 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[19] → 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) • 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 • Full implementation of existing measures should ensure disinfection of WWTP effluent prior to discharge and proper disposal of sludge • 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 (storage and application) [20]

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

	- Cultivation of nitrogen fixing crops and catch crops in EFAs (EU CAP) - Better use of CAP Pillar II (Rural Development Programmes) for dark green measures under Priority 4 (e.g. Preservation and restoration of permanent grasslands) - Promotion of organic and HNV farming, by setting a target of e.g. 10% of total arable land - Creation of buffer stripes, especially in areas with increased agricultural activities - Implementation of water pollution charges in food industry, in line with the polluter pays principle - Economic incentives for modern irrigation water saving techniques
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. • Potential new measures extracted from the European Commission Staff Working Document[21] that can be considered include: - 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, - site management such as fallowing, treatments, and exclusion zones, - 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 include[22] - 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. 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[23], 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

[20] http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-5/index_en.htm
[21] 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
[22] http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-5/index_en.htm
[23] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.

Knowledge/data Monitoring	During the Sub-regional Workshop under ActionMed Activity 3, stakeholders from the Adriatic countries identified as main gaps on eutrophication the modeling 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

III. Contaminants

III.i. Description of pressures, impacts and drivers

36. 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 contaminants from land-based sources, such as oxygen-depleting substances, heavy metals, POPs, hydrocarbons, and nutrients (see chapter II. 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, and dumping grounds) or non-point sources (including fluvial and stormwater run-offs, and sewage discharges). Other important pathways of contaminants include sea-based sources (shipping, fishing, and offshore activities) and atmospheric deposition. [24]

37. The introduction of those contaminants causes significant impacts on marine biodiversity and risks to human health. With regards to **organic matter** carried by inadequately treated wastewater, it is measured as BOD, standing for Biochemical Oxygen Demand[25]. According to the SoER-MED, 2012[26], the most affected areas in the region are the southern shore of the Western Basin, the eastern coast of the Adriatic, the Aegean and the northern eastern sector of the Levantine Basin. Organic matter affects the marine environment in two ways: first they reduce light penetration in water, causing a decreased release of oxygen, while they also use oxygen in order to decompose. Those processes, especially in combination with human-induced eutrophication in certain areas cause water oxygen depletion, impacting primarily fish and shellfish[26].

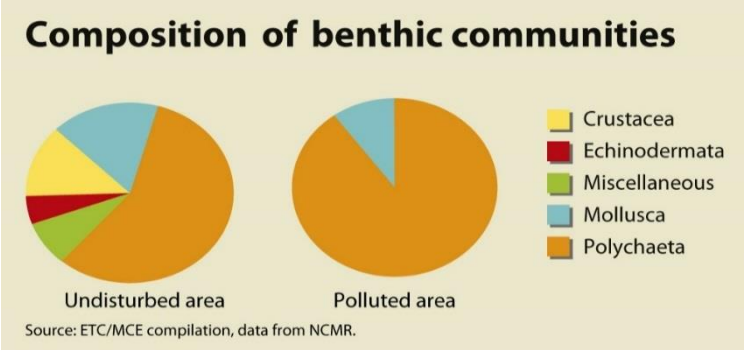


Figure 2: Composition of benthic communities in undisturbed and polluted areas
(Source: ETC/MCE compilation, data from NCMR)

Benthic communities are particularly impacted, and a major decrease in biodiversity is identified in polluted areas (Figure 2). Massive inputs of organic material may create anoxic zones and proliferation of

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

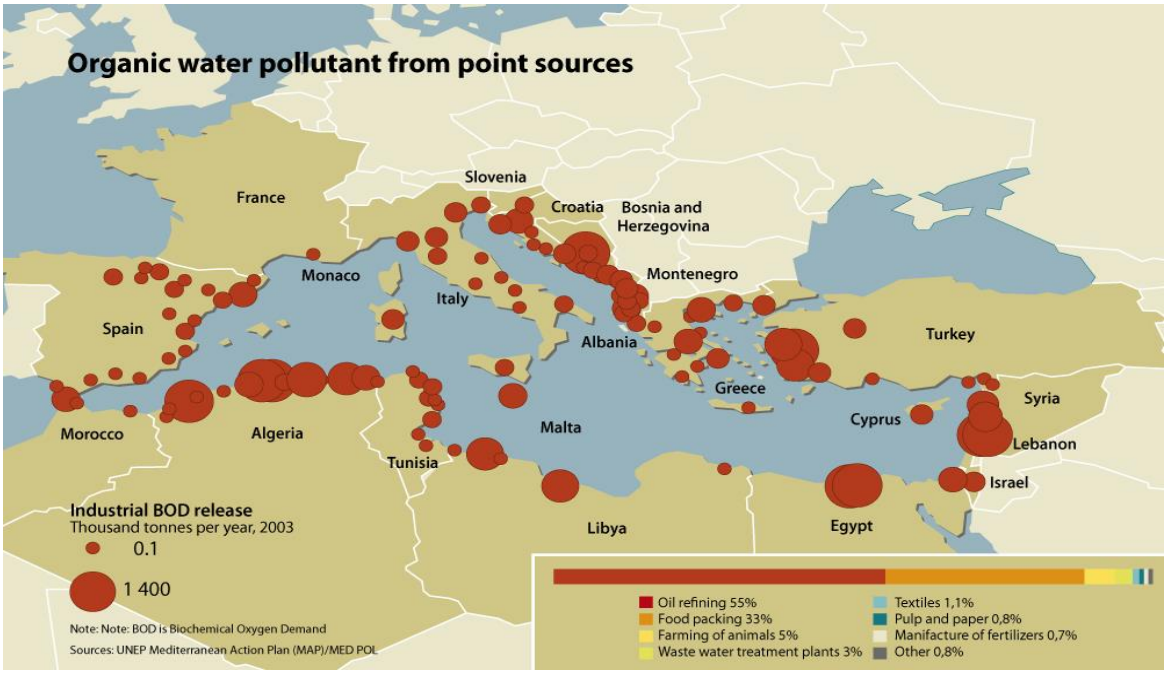
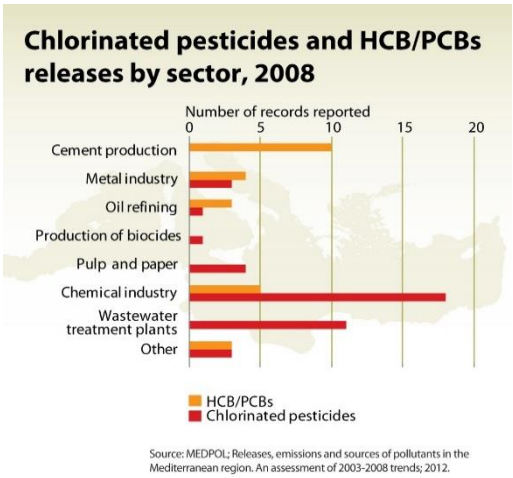


Figure 3. Organic water pollutant from point-sources (Source: UNEP/MAP – MED POL)

38. **Heavy metals** (toxic metals that are persistent and bioaccumulate in human and animal tissues) are another priority pollution type for the Mediterranean. 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. [27]

39. **Persistent Organic Pollutants (POPs)** are resistant to environmental degradation and therefore they can persist in the environment, they can be transported by wind and water, they bioaccumulate in tissues and biomagnify in food chains[28]. These characteristics make POPs extremely dangerous for the environment and human health. POPs include chlorinated pesticides, HCB, PCBs, PAHs etc. Exposures to POP have been linked to declines, diseases, or abnormalities of animal species, as they may disrupt the endocrine system, and influence the reproductive system 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[29]. [30]



[27] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012
[28] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012
[29] https://www.epa.gov/international-cooperation/persistent-organic-pollutants-global-issue-global-response#affect

40. **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.[30]

III.ii. Existing measures at regional level

41. As already mentioned, marine pollution reduction was the initial focus of UNEP/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).

42. Pollution remains until today a priority issue for UNEP/MAP 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 (through its component 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:

Table 6. 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

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

	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

43. 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 7. 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 • 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	2013	Perfluorooctane sulfonic acid, its salts and perfluorooactane sulfonyl fluoride
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,Penta chlorobenzen

44. 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 minimise 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

45. Finally the **Offshore Action Plan**, which was adopted by the COP19 in 2016, for the implementation of the Offshore Protocol, also includes provisions relevant to pollution from contaminants. It sets out the general objective of defining 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. Some of the most important outputs set out in the Action Plan that should be taken into account for the development of a Regional PoM are the following:

- Publication every two years on a dedicated website of the inventory of installations as well as the discharges, spills and emissions from offshore oil and gas installations data submitted by the Contracting Parties
- Consolidated report every two years on the discharges, spills and emissions from offshore oil and gas installations data submitted by the Contracting Parties
- Environmental impact assessment regional standards developed based on existing EIA regional standards taking into consideration requirements referred in Annex IV and other best practices
- Common standards, on the use and discharge of harmful or noxious substances and material, in line with relevant international standards and conventions defining inter alia limits and prohibitions at regional level formulated and adopted
- Identification of the required modifications of Annex I, II and III and definition of which chemicals should be covered and not covered by such standards and under which conditions
- Common standards on the disposal of oil and oily mixtures and on the use and disposal of drilling fluids and cutting formulated and adopted, and revision of the limits set in Article 10 and the prescriptions referred in Annex V of the Protocol
- Special restrictions or conditions for SPAs defined and adopted
- Regional Guidelines on Environmental Impact Assessment
- Regional Guidelines on the use and discharge of harmful or noxious substances and material
- Regional Guidelines on the disposal of oil and oily mixtures and the use and disposal drilling fluids and cutting and analytical measurement
- A regional monitoring programme for offshore activities building, inter alia, on the Integrated Monitoring and Assessment Programme
- The development/adoption of Mediterranean Monitoring Procedures and Programmes for the above, in consultation with relevant stakeholders, building on the relevant work undertaken in the Monitoring Correspondence Groups in the EcAp process in line with Decision 21/3
- Development of the Mediterranean Offshore Reporting and Monitoring System (e.g. Regional Data Bank on Offshore activities through the Barcelona Convention Reporting System or other systems defined by the Contracting Parties)

46. 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:

a. Knowledge/data

- 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. (UNEP/MAP/MED POL 2011)
- Data availability on oil discharges is insufficient.
- Reporting of the Contracting Parties on marine pollution under MED POL should be made at an annual base and a regional Pollutant Release and Transfer Register (PRTR) should be established[31].
- 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[32].

b. Implementation/enforcement of legislation

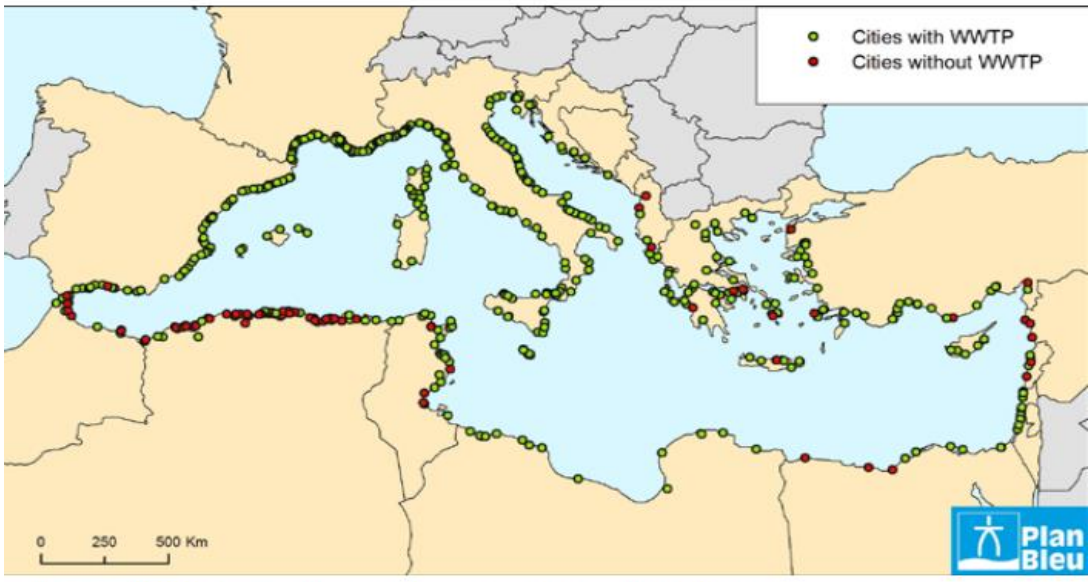
- The amendments of the Dumping Protocol are not yet in force.
- The Offshore Protocol has entered into force, but it is still ratified by a minority of Contracting Parties.
- Enforcement of environmental legislation on marine pollution is in general weak especially in the ENP-South countries.
- Organotins continue to be present in substantial concentrations despite the ban on their use[33]. This can be attributed to the slow degradation rhythm of those substances.
- Although a big number of Mediterranean countries have ratified the MARPOL Convention, many of them have not yet established a respective legal framework for its implementation[34].
- 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 could, according to the SoER-MED[35], be alarming at indicate an ongoing input of PCBs. Moreover, in areas where trend analysis is possible, PCB concentrations in biota have remained relatively constant or, in some cases, slightly increased (northwestern and Eastern Mediterrnaean).[36]

c. Waste and wastewater management

- About half of the organic matter from sewage originates from direct, untreated discharges and around one third from discharges of inadequately treated sewage[37.] In order to effectively remove pollutants from wastewater, secondary and preferable tertiary treatment should be established. However, 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 very low (8% at regional level), especially in the ENP South Countries (only 1%) (UNEP/MAP MED POL, 2011)[38].

[31] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.
[32] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.
[33] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012
[34] UNEP/MAP, 2015. Draft Ecosystem Approach based Measures Gap Analysis. UNEP(DEPI)/MED WG.420/5
[35] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012
[36] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012
[37] UNEP/MAP: State of the Mediterranean Marine and Coastal Environment, UNEP/MAP – Barcelona Convention, Athens, 2012
[38] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.

- The reuse of treated wastewater is only 7% in the Mediterranean and 1% in the ENP South countries[39], which is highly unsustainable, especially if the future impacts of climate change are taken into account that will affect heavily the Mediterranean region in terms of raised temperature, and lower precipitation levels.
- In ENP South Countries 58% of the collected municipal solid waste is disposed in open dumps[40].
- There are insufficient accounting and cost-recovery mechanisms in most of the countries regarding wastewater and solid waste management[41].
- According to the H2020 Mediterranean Report[42], 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.
- Green infrastructure and nature based solutions are not adequately implemented with regards to water and stormwater management.
- 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 4)[43].
- There are important sectors contributing to pollution from contaminants that are not adequately regulated at regional level, including desalination, agriculture, aquaculture and tanneries[44].
- In the Mediterranean, there was a general upward trend for mercury and lead between 1998 and 2012[45] that needs to be further examined.



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

Figure 4. Overview of the major coastal cities with/without WWTPs in 2010 (Source: Horizon 2020 Mediterranean Report, EEA, 2014)

[39] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp
[40] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.
[41] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.
[42] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.
[43] Horizon 2020 Mediterranean Report –Toward shared environmental information systems, EEA-UNEP/MAP joint report, 2014, 142 pp.
[44] UNEP/MAP, 2015. Draft Ecosystem Approach based Measures Gap Analysis. UNEP(DEPI)/MED WG.420/5
[45] State of Europe's seas, European Environment Agency, 2015

d. Planning

- The urban population growth projections should be better taken into account for the development of future waste and wastewater management strategies.
- 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[46].
- 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)[47] is not adequately addressed and reflected in UNEP/MAP framework to combat pollution.

III.iii. Gaps and proposals

47. 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 8. Gaps related to measures for contaminants

Priority sources and pressures	Gaps related to measures
Wastewater	• New measures are needed to ensure that secondary treatment is undertaken at the majority of WTTP (with the adoption of a specific target) and to promote the tertiary treatment (again with a measurable target) • New measures should provide for application of pretreatment technologies • New measures with quantifiable targets are required to increase the reuse of collected wastewater • The obligation for the establishment and operation of WWTP in all major cities should be better implemented • Disinfection of WWTP effluent prior discharge and proper disposal of sludge should be ensured. The use of sludge for energy production purposes can be considered • Control and inspections over the emptying of cesspits, particularly in hotels and major residential or industrial facilities, should be enhanced • 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
Solid Waste	• Existing measures providing for adequate treatment of all the collected wastes should be better implemented and enforced • Measures should provide for assessment of the cost of waste management and further promote full cost recovery for solid waste management • New measures should be adopted to enhance municipalities' role

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

	and capacity in waste management Measures proposed by SEEP-NET include: - Full cost accounting - Cost recovery - Cleaner production - Material light weighting - New waste technologies (i.e. biogas production) • Existing measures providing for closure of all illegal dump sites must be fully implemented and enforced, while a full restoration of contaminated sites should be ensured as well as regular monitoring to control the environmental state of the site • Partnerships with NGOs and civil society groups should be enhanced to promote sustainable waste 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 DDT than PCB, which may indicate an ongoing input → stricter implementation and enforcement of the measures for the elimination of PCB is required. • Despite the ban of organotins since 1990, they continue to be present → Stricter implementation and enforcement of the measures that prohibit the use of organotins are required • Better 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 There is need for better implementation of measures for the elimination of mercury inputs and the adoption of strict measures for lead inputs
"New" 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, in line with the provision under the EU Biodiversity strategy) • New measures should promote the accounting of depollution/degradation cost, as part of the ecosystem services assessment • The depollution gap[48] needs to be further addressed in the Regional Plans
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

IV. Marine Litter

IV.i. Description of pressures, impacts and drivers

48. Marine litter is one of the most critical issues, oceans are facing today, causing serious impacts and adverse effects on marine and coastal biodiversity and also hindering human activities. It is estimated that six million tons of marine litter items enter the world's oceans every year, with plastics being the most abundant marine litter type[49]. 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[50]. In that view, the Manila Declaration, which was adopted in 2012 highlights 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.

49. 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 high concern since the first years of UNEP/MAP. Especially for the Mediterranean coast, recent studies (Eriksen et al., 2014) have revealed that may be more affected than the oceanic gyres. According to the Marine Litter Assessment in the Mediterranean[51], cigarette butts is by far the most commonly found type of marine litter in the Mediterranean **beaches**, found even in remote areas; 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[52]. 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).

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[48] http://ufmsecretariat.org/wp-content/uploads/2014/06/FinalReport-Reduced_file_size.pdf
[49] http://www.perseus-net.eu/site/content.php?locale=1&sel=517&artid=565
[50] UNEP(OCA)/LBA/IG.2/7, 5 December 1995
[51] Marine Litter Assessment in the Mediterranean, UNEP/MAP, Athens, 2015
[52] Marine Litter Assessment in the Mediterranean, UNEP/MAP, Athens, 2015

50. 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)[53]. 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[54]. 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 5 (UNEP/MAP – BP/RAC, 2009).

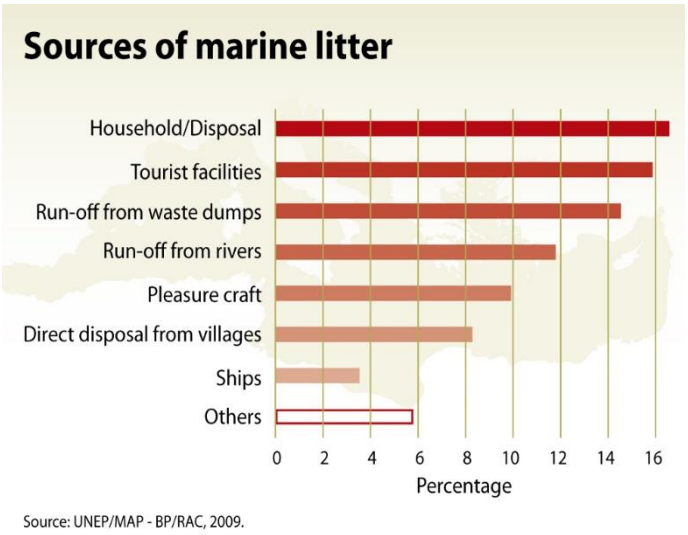

Figure 5. Sources of Marine Litter
(Source: UNEP/MAP –BP/RAC, 2009)

51. The 2015 Marine Litter Assessment in the Mediterranean[55] suggests the division of general sources to use-categories sources including recreational litter, shipping litter, fishing litter, sewage-related debris, tourist litter, sanitary and medical litter, in order to 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.

52. 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[56] while toxins are accumulating and may be transferred across the food chain, leading to a biomagnification effect[57].[58] The following table, listing the main impacts of marine litter, is developed according to the UNEP/MAP, 2015 Marine Litter Assessment in the Mediterranean.[59]. However for many of those impacts there are still uncertainties that need to be further explored.

Table 9. Main impacts of marine litter (Original source UNEP/MAP, 2015[59])

Sector	Impacts	Comments
Wildlife	Entanglement	Birds (35%), fish (27%), invertebrates

[53] Marine Litter Assessment in the Mediterranean, UNEP/MAP, Athens, 2015
[54] Marine Litter Assessment in the Mediterranean, UNEP/MAP, Athens, 2015
[55] Marine Litter Assessment in the Mediterranean, UNEP/MAP, Athens, 2015
[56] Rochman et al. 2013
[57] Wright et al., 2013
[58] UNEP, 2016 Marine Litter Legislation: A Toolkit for Policymakers
[59] Marine Litter Assessment in the Mediterranean, UNEP/MAP, Athens, 2015

		(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 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, UNEP/MAP, 2015 (original information Mouat et al. 2010).

IV.ii. Existing measures at regional level

53. As already mentioned, marine litter has been an issue of high concern for UNEP/MAP since its first years. The LBS Protocol to the Barcelona Convention that was adopted in 1980 acknowledges the importance of marine litter problem, providing a first definition of marine litter in Annex I. In 1991 UNEP/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/UNEP/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 Plan on Marine Litter, in the framework of the Article 15 of the LBS Protocol to the Barcelona Convention.

54. The Regional Plan on Marine Litter Management in the Mediterranean was finally adopted in 2013 by the COP18, making UNEP/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 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.

55. 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 10. 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	2017	ALDFG Mitigation measures

sector		
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

56. It is clear that very important instruments have been adopted at regional level to prevent the generation of marine litter and reduce the existing litter. According to the 2015 Marine Litter Assessment in the Mediterranean and other assessments and studies, significant progress has been achieved so far, 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:

a. Knowledge and data[60] [61]

- Data collection has been improved across the region, however it lacks consistency and harmonization. According to the 2015 Marine Litter Assessment in the Mediterranean, data is geographically restricted mainly to parts of the North Mediterranean[60].
- For the moment, the main identified impacts of marine litter on marine biota include entanglement, ingestion, colonization and rafting[60]. The sub-lethal effects of marine litter ingestion on species populations, as well as their potential for secondary pollution are not adequately assessed.
- Although recognized as an issue of great concern, there is a general lack of knowledge regarding the number, and distribution of ALDFG, as well as its impacts on marine ecosystems.
- 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 the colonization of floating marine litter.
- Our understanding of transport dynamics and accumulation zones is limited[60].
- There is need for more research and improved knowledge on the degradation process of the different litter types (especially plastics) and the leachability of pollutants[60].
- The socio-economic impacts of marine litter have not been adequately assessed, especially regarding important economic sectors such as tourism, fishing and aquaculture.
- There is need to use more efficiently new technologies in litter monitoring, such as the unmanned aircraft systems (UAS), drones, ROVs, gliders etc.
- There is a lack of data with regards to the assessment of marine litter in the deep sea environments (over 500m)[60].

b. 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 efficient 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. Taking into account that three Mediterranean countries (France, Italy, and Spain) are in the top five European countries in cosmetics sales[62], measures are missing for the prevention/reduction of microplastics (microbeads) in PCCP.

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

- There is a lack of quantitative reduction targets for key items, in line with EU Communication 2014/398.
- More focus is put in practice on removal than prevention.
- Tourism is one of the sectors that contribute the most to marine litter. However there are no measures in the MLRP aiming at preventing the generation of litter from the tourism sector.

c. Management

- The percentage of inadequately managed waste remains very high in some countries, mainly the non-EU States, even more than 60% in some cases (Jambeck et al. 2015)[63].
- In ENP South Countries 58% of the collected municipal solid waste is disposed in open dumps, despite the existing measures.[64]
- 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[65].
- A regional survey prepared by UNEP/MAP and MIO ECSDE in 2015, revealed some important gaps, relating to ALDFG including i. insufficient facilities for effective management of derelict 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.
- Although it is proven that floating litter may facilitate the introduction and/or spread of invasive alien species, marine litter is not acknowledged as a potential vector of introduction in the recent assessments on primary pathways for introduction (Katsanevakis et al., 2013)[66].
- 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.

d. Implementation of environmental principles

- Awareness and public participation are relatively weak with regards to solid waste management in many Contracting Parties.
- There has been a significant decrease in public participation in the cleaning campaigns (70% decrease of volunteers between 2002-2013)[67].
- 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 nanoplastics, or human health risks.

IV.iii. Gaps and proposals

57. 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.

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[62] 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

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

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

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

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

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

Table 11. Gaps related to measures for marine litter

Priority 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 plastic bag ban • 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.)[68] • 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 to meet the safety and hygiene standards[69] • 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 [70] - Adoption of a common definition of microplastics - Adoption of a common methodology of sampling microplastics - 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 - Improvement of WWTP systems to cover this issue - Prohibition or adoption of best management practices of nurdles (pre-production plastic)[71]. • 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[72]. A prohibition of manufacture of microbeads can also be considered, as practiced by several States globally[73]
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

[68] http://whatis.techtarget.com/definition/bioplastic
[69] UNEP (2016) Marine Litter Legislation: A Toolkit for Policymakers
[70] 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
[71] 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
[72] UNEP (2016). Marine plastic debris and microplastics – Global lessons and research to inspire action and guide policy change. United Nations Environment Programme, Nairobi
[73] UNEP (2016) Marine Litter Legislation: A Toolkit for Policymakers

	• cigarette bans on beaches (USA, UK, Canada)[74] • 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[75] 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
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: - Port reception facilities in small harbors and marinas - Better enforcement of the general prohibition of waste discharge from ships • According to a recent study for the European Commission, although the legal framework for waste from ships is quite comprehensive there are some gaps that need to be addressed. New measures should be considered mainly with regards to the following issues[76]: - Limitation of the existing exemptions applying to some vessel types, such as small recreational and fishing vessels - Establishment of an harmonized port fee system, to ensure: removal of incentives for waste disposal at sea, level playing field between ports, cost coverage and maintenance of incentives for waste minimization - Support of actions at port level to reduce waste generation at ships - Information requirements that enable and facilitate the detection of potential offenders - Improvement of inspection framework - Better enforcement and stricter sanctions
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[77] including: • Microplastics (numbers, and impacts)

[74] UNEP (2016) Marine Litter Legislation: A Toolkit for Policymakers
[75] UNEP (2016) Marine Litter Legislation: A Toolkit for Policymakers
[76] 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
[77] Marine Litter Assessment in the Mediterranean, UNEP/MAP, Athens, 2015

	• 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	More integrated and comprehensive monitoring is required, in the framework 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, 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)[78] 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. [79]
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 measure are required to ensure prevention at source, including: • shift to more sustainable production patterns (links with SCP) • adoption and implementation of a circular economy strategy • 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 • cooperation with stakeholders including producers, retailers, NGOs and civil society groups ("Green Deals")

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

Removal	Better implementation of existing measures should be achieved including: • Enhanced participation in clean up campaigns • More and targeted cleaning activities (e.g. on riverbanks) • Stronger implementation of Fishing for Litter initiatives
Circular Economy	In the MLRP there are many provisions in line with the Circular Economy concept, but it is not fully implemented in practice. • A potential new measure can be the development of a Circular Economy Strategy at regional level, integrating and further developing the provisions set out in the LBS Protocol, the SAP/MED, the pollution related Action Plans and the SCP Action Plan, in view of designing and producing durable, easily repairable, recyclable and recoverable items • A turn waste into resources[80] approach should be established in the Mediterranean, making business, and the civil society aware of the remaining value of end products, while respectively reforming the national legislations to better integrate this issue
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 process[81]
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, having high effectiveness and low cost are : • Taxes on plastic bags • Direct Payment awards (fishing gear, bottles (to fishermen) etc.) Other instruments that can be considered are the landfill tax[82]

V. Special Note on the links between WFD and MSFD measures

Analysis of gaps related to measures for the implementation of the WFD and their relevance to MSFD PoM

58. The Commission SWD "Report on the progress in implementation of the Water Framework Directive Programmes of Measures"[83] provides Recommendations for the Member States, with the

[80] European Commission Communication; COM(2014) 398 final Towards a circular economy: A zero waste programme for Europe
[81] 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
[82] The Scottish Landfill Tax was introduced in April 2015 in the framework of the Scotland's Zero Waste Plan (2010)
[83] SWD (2015) 50 final

aim to assist them in identifying the areas where improvement in the implementation of the WFD is needed and the gaps that should be addressed as a priority in the second cycle of RBMPs.

59. It is interesting to note that there are some recommendations that are repeated for several Mediterranean counties, while some recommendations concern almost all of them.

60. These recommendations should be considered in the framework of the MSFD, since there are strong links between the two Directives, and the measures, and subsequently their gaps, under the WFD can support or hinder the achievement of the GES under the MSFD, regarding the pollution-related targets (mainly contaminants and eutrophication). According to the European Commission's recommendation on the MSFD Programmes of Measures[84], a certain level of coordination is required between the two PoM to ensure that the impacts of WFD PoM on marine waters is taken into account for the development of the MSFD PoM. Therefore it is important to review the gaps identified in the WFD PoM and try to address them in the framework of MSFD PoM, as appropriate.

61. The most commonly found recommendations with regards to Mediterranean countries that should be taken into consideration for the development of PoM also in the framework of the MSFD are the following (see Figure 6 for the number of countries concerned):

- Green Infrastructure: to consider and prioritize the use of Green Infrastructure and/or natural water retention measures, that provide a range of environmental social and economic benefits
- Value of water: To undertake an economic analysis of water use and ensure full cost recovery including the environmental costs
- Climate Change: climate change issues should be further considered, including pressure analysis, monitoring, climate check on measures, "climate proofing" etc.
- Wastewater treatment: better identification of links with UWWTD, full implementation of and compliance with the Directive and adoption of stricter measures where the measures under the WWFD are not enough to bridge the gaps
- Protected areas: better links between measures and the needs/objectives of protected areas should be established

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

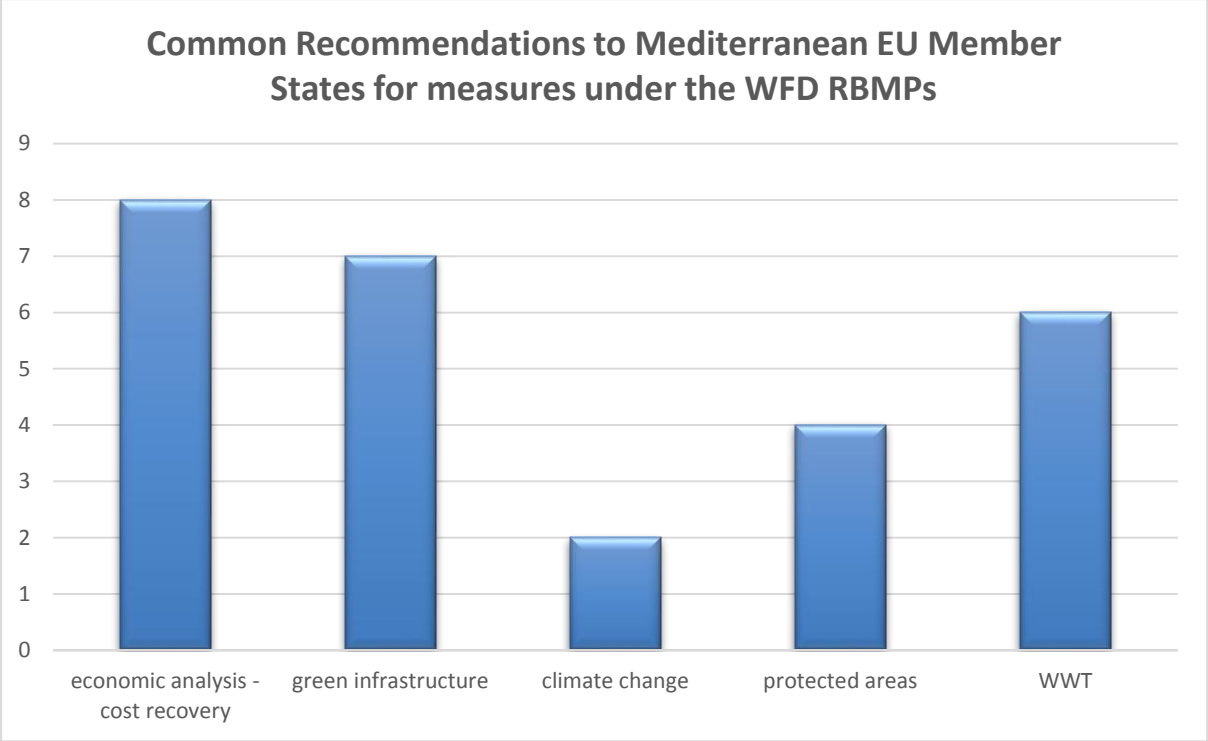

Figure 6. Common Recommendations for WFD measures
Source: European Commission DG Environment 2014, Recommendation on Programmes of Measures (Annex to doc MD 2014-1/1)

VI. Conclusion

62. The Mediterranean Sea, with its unique characteristics, rich fauna and flora and important habitats represents an important part of world's biodiversity and largely supports the socioeconomic development of the region. In order to provide a full range of ecosystem services and continue supporting different human activities, it has to be maintained in a good environmental status. However, multiple and often cumulative pressures resulting from human activities, have since long caused significant degradation of the Mediterranean marine and coastal ecosystems, threatening their resilience and putting in danger major socioeconomic activities in the region. In response, the Barcelona Convention UNEP/MAP and its Protocols, the Strategic Action Programmes and a number of Regional Plans have been progressively adopted by the riparian countries, to provide a comprehensive legal framework, aiming to address efficiently the different pressures and ensure the conservation of marine ecosystems. Furthermore, under the ecosystem approach structuring both the EU MSFD and the EcAp initiative adopted by the Barcelona Convention, the different instruments are coordinated in an integrated manner, in order to reach the objective of Good Environmental Status (GES) for the coastal and marine Mediterranean ecosystems.

63. In this context, , it has been decided to develop a Regional Programme of Measures, consisting of measures able to bridge the gap between the GES and the current situation and ensure the achievement of GES, including existing and new measures. The objective of this study undertook in the framework of the EU ActionMed project with the support of UNEP/MAP was to review the measures that have already been adopted, to assess their level of implementation and their capacity to bridge the gaps and finally examine the need to adopt additional measures, in order to establish an efficient Regional PoM, and avoid any duplications, gaps or overlapping. Therefore, the present study is supporting the development of Regional PoM by addressing the main environmental pressures related to pollution (eutrophication, contaminants, marine litter). For each of these pressures, the analysis has been conducted following a homogenous methodology and systematic approach.

64. The results of this study will be presented at national and regional workshops gathering stakeholders in charge to develop costal and marine policies in the Mediterranean. These workshops will be organised both in the frameworks of the ActionMed project and UNEP/MAP, in order to elaborate in a participatory way a Regional Programme of Measures that could be adopted by the Mediterranean countries in order to achieve the GES of the coastal and marine Mediterranean ecosystems.

List of Acronyms

ALDFG	Abandoned, lost or otherwise discarded fishing gear
BATs	Best Available Techniques
BEPs	Best Environmental Practices
BOD	Biochemical Oxygen Demand
CAP	Common Agricultural Policy
CFP	Common Fisheries Policy
CIS	Common Implementation Strategy
COP	Conference of Parties
EcAp	Ecosystem Approach
EFA	Ecological Focus Areas
EIA	Environmental Impact Assessment
ELV	Emission Limit Value
ENP	European Neighborhood and Partnership
FAO	Food and Agriculture Organization
GES	Good Environmental Status
HCB	Hexachlorobenzene
HELCOM	Baltic Marine Environment Protection Commission - Helsinki Commission
HNV	High Nature Value
IAS	Invasive Alien Species
ICC	International Coastal Cleanup
ICZM	Integrated Coastal Zone Management
IMAP	Integrated Monitoring and Assessment Programme
LBS	Land-based sources
MLRP	Regional Plan for the Marine Litter Management in the Mediterranean
MoU	Memorandum of Understanding
MSCG	Marine Strategy Coordination Group
MSP	Maritime Spatial Planning
MSFD	Marine Strategy Framework Directive
MSSD	Mediterranean Strategy on Sustainable Development
MTA	multi-trophic aquaculture
NAP	National Action Plans
NIS	Non-indigenous species
PAH	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
PSC	Port State Control
RBMP	River Basin Management Plan
ROV	Remotely Operated underwater Vehicle
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
SoER-MED	State of the Mediterranean Marine and Coastal Environment
UAS	unmanned aircraft systems
UfM	Union for the Mediterranean
UNEP	United Nations Environment Programme
UNEP/MAP	United Nations Environment Programme – Mediterranean Action Plan
WFD	Water Framework Directive
WWTP	Wastewater Treatment Plant

References

Alien species in the Mediterranean Sea by 2012. A contribution to the application of European Union's Marine Strategy Framework Directive (MSFD). Part 2. Introduction trends and pathways; A, Zanetos, S.Gofas, C. Morri, A.Rosso, D. Violanti, J.E. Garcia Raso, M.E. Cinar, A. Almogi-Labin, A.S. Ates, E. Azzuro, E. Ballesteros, C.N. Bianchi, M. Bilecenoglu, M.C. Gambi, A. Giangrande, C. Gravili, O. Hyams-Kaphzan, P.K. Karachle, S. Katsanevakis, L. Lipej, F. Mastrototaro, F. Mineur, M.A. Pancucci-Papadopoulou, A. Ramos Espla, C. Salas, G. San Martin, A. Sfriso, N.Streftaris, M. Verlaque; Mediterranean Marine Science, 13/2, 2012, 328-252

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

European Commission COM(2014) 97 final, Report form the Commission to the Council and the European Parliament – The first phase of implementation of the Marine Strategy Framework Directive (2008/56/EC), Brussels 20.2.2014

European Commission COM(2014) 398 final Towards a circular economy: A zero waste programme for Europe

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

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

European Commission SWD (2015) 50 final, Commission Staff Working Document Report on the progress in implementation of the Water Framework Directive Programmes of Measures

European Environment Agency 2014, Marine messages; Our seas, our future – moving towards a new understanding

Green Infrastructure Guide for Water Management: Ecosystem-based management approaches for water-related infrastructure projects, UNEP, 2014

Guidance on Monitoring of Marine Litter in European Seas. European Commission, JRC, European Union, 2013

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

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

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

Priorities for MSFD programmes of measures. Joint NGO paper – updated with additional chapter. Seas at Risk, MCS, CCB, BUND, Swedish Society for Nature Conservation, Oceana, WWF, BirdLife Europe, MIO-ECSDE, FISH, BSNN, FNE, North Sea Foundation, Surfrider Foundation Europe, Coastwatch Europe, SWAN, MEDSOS, OceanCare. October 2014

State of Europe's seas, European Environment Agency, 2015

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

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

UNEP (2015) Plastic in Cosmetics

UNEP (2016). Marine plastic debris and microplastics – Global lessons and research to inspire action and guide policy change. United Nations Environment Programme, Nairobi

UNEP (2016) Marine Litter Legislation: A Toolkit for Policymakers

Update of priority investment projects for the de-pollution of the Mediterranean Sea from pollution; Horizon 2020 –UFMS/NP/0102/2012; LDK, iME