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Proposed updated criteria to assess hotspots and sensitive areas

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1. Introduction

The 18th meeting of the Contracting parties to the Barcelona Convention (COP 18), held in Istanbul, Turkey in December 2013, requested the Contracting parties to update the National Action Plans adopted between 2003-2005 in the framework of Article 5 of the LBS Protocol of the Barcelona Convention. With the view to support countries in following a harmonized methodology to update the NAPs, the Secretariat developed NAP update Guidelines.

The meeting of the MEDPOL FP held on 26-28 March 2014 (Athens, Greece) reviewed and endorsed the main body of the Guidelines for Updating National Action Plans (NAPs): “Draft Guidelines for updating National Action Plans for the implementation of the LBS Protocol and its Regional Plans in the framework of SAP MED to achieve Good Environmental Status for pollution-related ECAP ecological objectives” (UNEP(DEPI)MED WG.394/10). The Secretariat was asked to particularly continue the work for finalization of the technical annexes of NAP update Guidelines including one annex on the updated criteria on hotspots and sensitive areas assessment.

The main purpose of updating the criteria for the evaluation of national hotspots and sensitive areas is to address additional developments and updated legal and technical standards to meet ECAP GES targets and the legally binding commitments under the Regional Plans (Article 15 of the LBS Protocol).

The present document represents a revised version of Annex C of document (UNEP(DEPI)MED WG.394/3). The revised version has taken into account comments received from Israel, France and UfM Secretariat. It benefited from experiences of other international frameworks on hotspots identification and assessment such as World Bank (WB), Union for the Mediterranean (UfM) and Regional Seas Conventions and Action Plans (RSC). as well as from the testing of a considerable number of proposed criteria using real hotspot cases.

This document has two main sections. Section I tackles a state of play about hotspot definitions and related assessment criteria used by different organisations, initiatives or programmes. Section II contains the Secretariat’s proposal for assessing and evaluating hotspots in the Mediterranean. This section, in turn, is structured into three stages, addressing:

- a) Preliminary screening methodology (checklist) of potential hot spots.
- b) Proposed updated criteria for hot spots evaluation.
- c) Application of proposed criteria illustrated on an example.

2. SECTION I: Background

Hot spot and sensitive area definition and related assessment criteria constitute an important key step in strategies against pollution of marine and coastal environment. Identification of pollution related hot spots and sensitive areas has been used as an efficient tool to raise public and policy makers awareness as well as to prioritize environmental investment at national and regional levels to protect the marine and coastal ecosystems.

References on evaluation of hot spots and environmental status assessments developed by other international agreements for the protection of marine environment and previous assessments of hotspots in the Mediterranean Sea, have been consulted to analyse and compare the related definitions and assessment criteria.

It has been observed that progressively, the hot spot concept has been linked with the ecosystem approach, e.g. Good Environmental Status (GES) and environmental targets. The regional seas action plans and conventions with a stronger experience on hot spots evaluation and assessment are UNEP/MAP-Barcelona Convention and Helsinki Commission.

2.1. Evaluation of Hot spots in the Mediterranean

2.1.1. Second Report on the pollution hotspots in the Mediterranean (UNEP/MAP, 2003)

The first assessment was developed in 1999 and updated in 2003 by the **Second Report on the pollution hotspots in the Mediterranean (UNEP/MAP, 2003)**. The methodology provided a comprehensive and multidisciplinary approach where SAP-MED priorities and public health were the most considered aspects. The 2003 hot spot assessment methodology was successfully implemented and was acknowledged for its high value in identifying and prioritizing national hot spots. Based on this methodology the Mediterranean countries identified and prioritized 101 Mediterranean hot spots.

Hot spot definition and methodology are summarized below.

Hot spot definition:

- (a) **Point sources** on the coast of the Mediterranean Sea which potentially **affect** human health, ecosystems, biodiversity, sustainability or economy in a significant manner. They are the **main points where high levels of pollution loads** originating from domestic or industrial sources are being **discharged**;
- (b) Defined **coastal areas** where the **coastal marine environment is subject to pollution** from one or more point or diffused sources on the coast of the Mediterranean which potentially **affect** human health in a significant manner, ecosystems, biodiversity, sustainability or economy.

Hot Spots Indicators (primary) were as follows:

- BOD₅, COD
- nutrients (phosphorus, nitrogen),
- total suspended solids,
- oil (petroleum hydrocarbons),
- heavy metals,
- persistent organic pollutants,

- radioactive substances (whenever applicable),
- litter,
- microorganisms (faecal coliforms, *E.coli*).

A ranking system from 1-6 was followed to show the severity of each of the effects on the identified hot spots. A table on the national hot spots was required for their evaluation using the following criteria:

The risk exerted by the point sources with effects on:

- public health
- drinking water quality
- recreation
- other beneficial uses
- aquatic life (including biodiversity)
- economy and welfare (including marine resources of economic value).

has been graded as follows:

- 1 for no effects
- 2 for slight effects
- 3 for moderate effects
- 4 for major effects
- 5 for severe effects
- 6 for extreme effects

In order to weigh the risk in an equal manner, a multiplier depending on the importance of the effects on the several issues was applied to the grades:

- 1.0 for public health
- 0.9 for drinking water quality
- 0.8 for recreation
- 0.8 other beneficial uses
- 0.7 for aquatic life including biodiversity
- 0.7 economy and welfare including marine resources of economic value

Annex I of this document explains the criteria used in 2003 for ranking the effects.

2.1.2. Rapid Assessment of Pollution Hotspots for the Adriatic Sea (WB, 2011)

In 2011, the World Bank developed the **Rapid Assessment of Pollution Hotspots for the Adriatic Sea (WB, 2011)** in which a multidisciplinary approach was also proposed with the criteria categories and scores presented in *Table 1*.

Table 1. Criteria categories and scores used in ranking pollution hotspots by World Bank (WB, 2011).

No	Category / Criteria	Score
1.	Category: Target Population	10
1.1.	- Population size	1- 10
2.	Category: Public Health	30
2.1	- Risks from wastewater	1-10
2.2	- Risks from solid waste	1-10
2.3	- Risks from other contaminants	1-10
3.	Category: Economy Value	20

No	Category / Criteria	Score
3.1	- Tourism importance	1-10
3.2	- Aquaculture and fisheries importance	1-10
4.	Category: Biodiversity and Ecosystem services	30
4.1	- Risks from eutrophication	1-10
4.2	- Presence of invasive species	1-10
4.3	- Sensitivity of natural environment	1-10
5.	Category: Trans-boundary (TB) and Trans-regional (TR)	10
5.1	- TB and TR effects	1-10

The study confirmed the existence of 27 hotspot pollution sites in the Adriatic Sea bordering countries as per WB study.

2.1.3. Update of priority investment projects for the de-pollution of the Mediterranean Sea from pollution (UfM, 2013)

UfM Secretariat undertook in 2013 the study “**Update of priority investment projects for the de-pollution of the Mediterranean Sea from pollution**” which considered an update of the situation of hot spots in the Mediterranean identified by UNEP/MAP in 2003 taking into account additional commitments under the Regional Plans adopted based on Article 15 of the LBS Protocol which have stricter targets and standards than those agreed in the framework of the SAP-MED. The report presented a **total number of 127 hotspots** and proposed the following criteria, which should be addressed from a regional perspective:

- 1) Amount of pollutants discharged from a single outlet to the Mediterranean Sea (industrial or municipal) rather than just considering the presence of a point source.
- 2) Extent of pollution discharged in comparison with national or international standards. For example, for a specific outlet discharging wastewater, it should be considered as a hotspot unless the wastewater contaminants comply with national, regional or international standards within a certain range.
- 3) The trans-boundary impact of various types of pollutants.
- 4) The origin of the pollution.

2.1.4. Comparative summary of hot spot definitions and criteria

The following table presents different and common elements in the criteria used by UNEP/MAP, 2003, WB, 2011 and UfM, 2013. Annex II presents main definitions and criteria established by different international agreements on hot spots and sensitive areas.

Table 2. Common and different elements of hot spots assessments developed in the Mediterranean.

CRITERIA CATEGORY	UNEP/MAP, 2003 101 hot spots Mediterranean	WB, 2011 27 hot spots Sub regional- Adriatic	UFM, 2013 127 hot spots Mediterranean
Population	NO	YES	NO
Wastewater collection and treatment	YES	YES	YES
Drinking water quality	YES	NO	NO
Bathing water quality	NO	NO	NO
Organic matter	YES	YES	YES
Nutrients	YES (aquatic life)	YES (quality)	YES

CRITERIA CATEGORY	UNEP/MAP, 2003 101 hot spots Mediterranean	WB, 2011 27 hot spots Sub regional- Adriatic	UFM, 2013 127 hot spots Mediterranean
		risks)	
Contaminants	YES (aquatic life)	YES	YES
Marine litter	YES (other beneficial uses)	YES	YES
Economic activities (and ecosystem services underpinning them)	YES	YES	NO
Investment	YES	NO	NO
Transboundary/trans-regional effects	NO	YES	YES

3. SECTION II: Proposed updated criteria to assess hot spots and sensitive areas in the Mediterranean

The proposed methodology for evaluation of the hot spots and sensitive areas in the Mediterranean region based on updated assessment criteria comprises three main steps:

- Step 1: Screening for the listing of potential pollution hot spots and sensitive areas.
- Step 2: Assessing potential hot spots and sensitive areas based on updated criteria.
- Step 3: Testing the implementation of the updated assessment criteria on specific examples.

3.1. STEP 1: Screening for the listing of potential pollution hot spots and sensitive areas

An initial list of potential hot spots needs to be prepared to be evaluated with the proposed criteria in section 3.2. Table 3 describes general criteria for the sites which should be included in the potential list of hot spots. A nation-wide list of sites has to be assembled for each screening criteria, leading to a final list in which all sites answer the description of at least one of the screening criteria. The list will be based on:

- a) Knowledge of the emission loads, ambient pollutant concentrations, emission trends, development programs, etc.
- b) Where pollution data is missing, the list will also include sites for which there is a reason to assume some type of unmonitored environmental pressure is present.

Table 3. Screening criteria proposed for establishing a list of potential hot spots sites.

Criteria	Description	Environmental Pressures
Densely populated areas	Large population centres, popular touristic areas or densely populated coastal areas without adequate wastewater treatment (municipal pollution hot spot site)	Wastewater, organic matter, marine litter and solid waste
Coastal industry	Sites with large untreated wastewater outlets in the sea	Wastewater, contaminants, organic matter
Big ports	Intense maritime transport routes and ports	Wastewater, solid waste, contaminants
Landfills and dump sites	Non sanitary landfills and dump sites located in proximity of the coastline	Marine litter and solid waste, Contaminants
Oil/gas drilling and mining sites	Oil/gas drilling and mining activities in proximity of the coastline or at the sea	Contaminants
Big aquaculture areas	Areas with intensive fish and shellfish farming	Nutrients

Criteria	Description	Environmental Pressures
Large river discharges	Large river discharges, carrying along a) solid waste, b) urban wastewater, c) industrial wastewater, d) agricultural run-offs	Nutrients, solid waste, wastewaters
Intensive agriculture areas	Sea waters receiving substantial agricultural run-offs from the intensively cultivated coastal agriculture areas	Nutrients, contaminants
Historical pollution sites	Sites where pollution occurred in the past, but the risk to the environment is still present	Nutrients, contaminants, solid waste

3.2. STEP 2: Assessing potential hot spots and sensitive areas based on updated criteria

As explained in the background chapter of this document, the main purpose of updating hot spot and sensitive area assessment criteria is to take into account the GES targets adopted by COP 18 as well as the commitments under the Regional Plans of the LBS Protocol adopted by COP 17, 18 and 19. This will ensure a better balance among health, environmental and socio economic aspects as well as pressures and related state/impact on marine and coastal environment.

3.2.1. Proposed categorization for hotspots and sensitive areas

In 2003 UNEP/MAP evaluation, all hot spots were grouped into five categories, according to the magnitude of impacts and pressures. The five categories A, B, C, D, and E covered a range from extreme (category A) to insignificant effect (category E).

The updated evaluation proposes only four categories: A, B, C and D based on the resulting score for the assessment of pressures and the state of the environment (impacts).

- Priority hot spot / sensitive area (A),
- Hot spot / sensitive area (B),
- Potential hot spot / sensitive area (C),
- No hotspot or sensitive area (D).

3.2.2. Proposed criteria for evaluation of hot spots/sensitive areas

The proposed criteria categories are built based on categories and criteria established in 2003. The major changes have been made regarding:

- the organisation of categories and criteria has been approached from four different points of view: public health, environmental status, economics and transboundary effects,
- the inclusion of specific criteria regarding GES,
- the inclusion of alternative sub criteria for each category,
- the multipliers for balancing the importance of categories.

Thus, the following criteria categories for 2014 evaluation are proposed:

PUBLIC HEALTH	Good ENVIRONMENTAL STATUS	ECONOMICS	TRANSBOUNDARY EFFECTS
Population Wastewater treatment Drinking water quality Bathing water quality	Organic matter Nutrients Contaminants Marine litter	Economic activities (and ecosystem services underpinning them) Investment	Transboundary effects.

Rationale and description of particular adjustments made in 2014 with respect to 2003 for each category are described below:

(a) Public health

Public health category is composed of four subcategories: population, wastewater treatment, drinking water quality and bathing water quality. The category aims to measure the potential effect of hot spots on public health. In 2003, criteria on public health was based on discharges of BOD and hazardous substances, while drinking water quality was a separate category. In the proposed methodology, the size of potential population affected and the characteristics/effectiveness of wastewater collection and treatment system are the main considered criteria, in line with WB methodology (WB, 2011).

Drinking water quality (a separate category in 2003) has been included, with some minor adjustments, as a subcategory of public health in the proposed updated methodology. Bathing water quality has been introduced as a new subcategory in proposed updated methodology, in line with Decision IG.20/9.

(b) Environmental Status:

It contains four subcategories on organic matter (BOD), nutrients (P, N), contaminants and marine litter. Different alternatives have been developed to score each category: trends in discharges to the sea (pressure) or compliance with GES targets or other related thresholds.

In 2003 evaluation, indicators on substance discharges were not defined as categories but particularly considered to rank the effects on aquatic life (discharges reducing O₂ content, heavy metals and oil), recreation (oil) or other beneficial uses (solid waste).

(c) Economics

It assesses the effects of the potential hot spot on tourism, aquaculture/fisheries and other recreational activities as well as the level of investment needed to provide for environmentally sound solutions for potential hot spots. As seen from the description of the environmental status category, in 2003 recreation category was ranked based on the level of oil discharges. Particular sub criteria on tourism and aquaculture and fisheries have been introduced in proposed updated methodology in line with WB methodology.

Investment was also considered as a category in 2003 and has been maintained in the proposed updated methodology with minor adjustments.

(d) Trans-boundary effects

Category not considered as such in 2003 but criteria on thresholds were developed to be assessed through the other categories. It has been introduced in 2014 assessment based on WB criteria.

Finally multipliers have also been reviewed by giving more weight to public health and widening the gap between scores and hot spots categories. A comparison of the categories and multipliers for 2003 and 2014 evaluation of hot spots developed by UNEP/MAP is as follows:

Table 4. Comparison between proposed categories and multipliers (2014) and those used in 1999/2003 UNEP/MAP assessments.

2014		1999/2003	
Category	Multiplier	Category	Multiplier
Public health		Public health	1
1) Population	4	Drinking water quality	0.9
2) Wastewater treatment	4	Recreation	0.8
3) Drinking water quality;	4	Other beneficial uses	0.8
4) Bathing water quality;	4	Aquatic life including biodiversity	0.7
Environmental Status		Economy and welfare including marine resources of economic value	0.7
5) Organic matter	3		
6) Nutrients	3		
7) Contaminants	3		
8) Marine litter	3		
Economics			
9) Recreation and ecosystem services	2		
10) Investment	2		
11) Transboundary effects	1		

The following sections explain the criteria for ranking the effects/risks in each category:

3.2.3. Criteria on “PUBLIC HEALTH”

- 1) Criteria on **population** affected by the potential hot spot have been based on the size and distance. Only one of the alternatives (a) or (b) needs to be met for assigning the related score. If different alternatives and different scores are possible, the precautionary principle should be applied and the worst scenario chosen:

Table 5. Ranking criteria for population category.

POPULATION	
severe effects (4)	(a) Population size within a radius of 10 km is > 100,000 inhabitants.
moderate effects (3)	(a) Population size within a radius of 10 km is between 10,000 -100,000 inhabitants and/or (b) Population size is > 100,000 inhabitants within a radius of 20 km.
slight effects (2)	(a) Population size within a radius of 10 km is between 2,000 -10,000 inhabitants and/or (b) Population size is between 10,000 -100,000 inhabitants within a radius of 20 km.
negligible effects (1)	(a) Population size within a radius of 10 km is < 2,000 inhabitants and/or (b) Population size is between 2,000 -10,000 inhabitants within a radius

POPULATION	
	of 20 km.

2) Criteria on **wastewater treatment** have been based on the following definitions extracted from the Regional Plan on the reduction of BOD₅ from urban waste water in the framework of the implementation of Article 15 of the LBS Protocol (Decision IG 19/7):

- **Urban wastewater** means wastewater of the mixture of domestic waste water with industrial waste water pre-treated or not and/or run-off rain water;
- **Domestic wastewater** means wastewater from residential settlements and services which originates predominantly from the human metabolism and from household activities;
- **Collecting system** means a system of conduits which collects and conducts urban waste water;
- **Wastewater Treatment Plant WWTP** means systems used to treat urban wastewater using physical, chemical and /or biological techniques;
- **Agglomeration** means an area where the population of more than 2.000 inhabitants and/or economic activities are sufficiently concentrated for urban waste water to be collected and conducted to an urban waste water treatment plant or to a final discharge point;
- **Population-equivalent (p.e.)** means the organic biodegradable load having a five-day biochemical demand (BOD₅) of 60 g of oxygen per day;
- **Primary treatment** means treatment of urban waste water by a physical and/or chemical process involving settlement of suspended solids, or other processes in which the BOD₅ of the incoming waste water is reduced by at least 20% before discharge and the total suspended solids of the incoming waste water are reduced by at least 50%;
- **Secondary treatment** means treatment of urban wastewater by a process generally involving biological treatment with a secondary settlement or other process so that the treatment results in a minimum reduction of the initial load of 70-90% of BOD₅.

In addition, according to the World Bank Group¹, **tertiary treatment** is considered as any additional treatment beyond secondary. Tertiary treatment can remove more than 99 percent of all the impurities from sewage, producing an effluent of almost drinking-water quality. Disinfection, typically with chlorine, can be the final step before discharge of the effluent. However, there is some concern about chlorine residuals in the effluent.

The following tables describes the criteria for ranking the category, only one of the alternatives (a), (b) or (c) needs to be met for assigning the related score. If different alternatives and different scores are possible, the precautionary principle should be applied and the worst scenario chosen:

Table 6. Ranking criteria for wastewater collection and treatment category.

<p>WASTEWATER COLLECTION AND TREATMENT The effects of wastewater collection and treatment on public health have:</p>

¹ <http://water.worldbank.org/shw-resource-guide/infrastructure/menu-technical-options/wastewater-treatment>

WASTEWATER COLLECTION AND TREATMENT	
The effects of wastewater collection and treatment on public health have:	
severe effects (4)	a) Urban wastewater (agglomeration more than 10,000 PE) no collected or treated ² and/or b) Significant loads of industrial hazardous substances are discharged to municipal collecting system without treatment.
moderate effects (3)	(a) Urban wastewater (agglomerations more than 2,000 PE) no collected or treated ² and/or (b) Urban wastewater is collected and treated: <ul style="list-style-type: none"> I. only mechanical (primary) treatment for collected wastewater and/or II. the sewer network has big leakages and the wastewater treatment plant overflows frequently and/or. (c) Industrial loads of hazardous substances are discharged to municipal collecting system without treatment.
slight effects (2)	(a) Urban wastewater (agglomerations less than 2,000 PE) no collected or treated ² and/or (b) Urban wastewater is collected and treated: <ul style="list-style-type: none"> I. biological (secondary) treatment for collected wastewater and/or II. the sewer network has small leakages and the wastewater treatment plant hardly overflows and/or (c) Insignificant industrial loads of hazardous substances are discharged to the WWTP.
negligible effects (1)	(a) >99% of population connected to sewerage and/or (b) Advanced (tertiary) treatment or any additional treatment beyond secondary, e.g. disinfection for collected wastewater.

- 3) Qualitative criteria on the potential risk for land based industrial or urban solid waste disposal, industrial or urban wastewater discharge or other land based sources (e.g. run off from agriculture, farms or spills) to contaminate water sources (either groundwater or surface waters such as rivers and reservoirs) for **drinking water** have been defined:

Table 7. Ranking criteria for drinking water quality category.

DRINKING WATER QUALITY	
The quality of drinking water has effects on public health:	
severe effects (4)	Any industrial or urban wastewater, or solid waste or agricultural run off reaching a drinking water source without treatment.
moderate effects (3)	Any industrial or urban wastewater, or solid waste or agricultural run off reaching drinking water sources which are filtered but not disinfected before storage and distribution.
slight effects (2)	Any industrial or urban wastewater, or solid waste or agricultural run off reaching drinking water sources which are properly filtered and

² According to Decision IG 19/7, the Parties shall ensure that all agglomerations (>2,000 PE) collect and treat their urban waste waters before discharging them into the environment. The conditions are set in Annex I.

DRINKING WATER QUALITY	
The quality of drinking water has effects on public health:	
	disinfected before storage and distribution.
negligible effects (1)	No discharges/run offs affecting the water sources.

4) Categories on **bathing water quality** have been based on Decision IG.20/9 regarding Criteria and Standards for bathing waters quality in the framework of the implementation of Article 7 of the LBS Protocol, however, this category is also covered by other categories, e.g. contaminants. The following requirements should be met for sampling and analysis:

- Minimum sampling frequency: at least one per month and not less than four in a bathing period including an initial one prior to the start of the bathing period.
- For classification purposes at least 12 sample results are needed spread over 3-4 bathing seasons
- Reference method of analysis: ISO 7899-2 based on membrane filtration technique or any other approved technique

Table 8. Ranking criteria for bathing water quality category.

BATHING WATER QUALITY	
The quality of bathing water has effects on public health:	
Poor quality (4)	Water quality in bathing waters and other recreational areas is poor and can seriously undermine human health: (a) Percentage of intestinal enterococci concentration measurements (90th percentile intestinal enterococci/100 ml) > 185 cfu/100 mL and/or (b) No monitoring data.
Sufficient (3)	Water quality in bathing waters and other recreational areas is sufficient but may slightly undermine human health: (a) Percentage of intestinal enterococci concentration measurements (90th percentile intestinal enterococci/100 ml) = 185 cfu/100 mL
Good quality (2)	Water quality in bathing waters and other recreational areas is good: (a) Percentage of intestinal enterococci concentration measurements (95th percentile intestinal enterococci/100 ml) between 101-200 cfu/100 mL
Excellent quality (1)	Water quality in bathing waters and other recreational areas is excellent: (a) Percentage of intestinal enterococci concentration measurements (95th percentile intestinal enterococci/100 ml) < 100 cfu/100 mL

3.2.3.1. Criteria on “ENVIRONMENTAL STATUS”

5) For the evaluation of the **organic matter**, releases of BOD₅ into the Mediterranean Sea (in kg/year) need to be calculated or estimated.

The following table describes the criteria for ranking the effects/risks, only one of the alternatives (a), (b) or (c) needs to be met for assigning the related score. If different alternatives and different scores are possible, the precautionary principle should be applied and the worst scenario chosen. If no data are available, the category will be ranked as moderate effects (3).

Table 9. Ranking criteria for Organic Matter category.

ORGANIC MATTER Human introduction of BOD ₅ in the marine environment has:	
Severe effects (4)	(a) Significant increase of inputs of BOD ₅ into seawater from previous year(s) and/or significant deviation from the RP/national ELV for point sources and/or (b) Significant deviation from GES target and/or national/regional/sub-regional thresholds/EQS.
Moderate effects (3)	(a) Increase of inputs of BOD ₅ into seawater from previous year(s) and/or deviation from ELV from point sources and/or (b) Deviation from GES target and/or national/regional/sub-regional thresholds/EQS and/or (c) No data available.
Slight effects (2)	(a) Increased inputs of BOD ₅ into seawater and/or deviation from RP/national ELV but meeting GES targets and/or national/regional/sub-regional thresholds.
Negligible effects (1)	(a) Decrease of inputs of BOD ₅ into seawater and meeting GES targets and/or national/regional/sub-regional thresholds.

- 6) For the evaluation of the **nutrients enrichment or eutrophication**, either releases of Total P and/or Total N into the hot spot area (in kg/year) or their concentration in water column (mg/l) need to be calculated or estimated.

The following table describes the criteria for ranking the effects/risks, only one of the alternatives (a), (b), (c) or (d) needs to be met for assigning the related score. If different alternatives and different scores are possible, the precautionary principle should be applied and the worst scenario chosen. If no data are available, the category will be ranked as moderate effects (3).

Table 10. Ranking criteria for nutrients category.

NUTRIENTS Human introduction of nutrients in the marine environment has:	
Severe effects (4)	(a) Significant increase of inputs of Total N and/or Total P into seawater from previous year(s) and/or (b) Significant increase of dissolved oxygen and/or chlorophyll concentrations in water column and/or (c) Significant deviation from GES target ³ and/or national/ regional/sub-regional thresholds/EQS.
Moderate effects (3)	(a) Increase of inputs of Total N and/or Total P into seawater from previous year(s) and/or (b) Increase of dissolved oxygen and/or chlorophyll concentrations in water column and/or

³ Reference nutrients concentrations according to the local hydrological, chemical and morphological characteristics of the un-impacted marine region.

NUTRIENTS	
Human introduction of nutrients in the marine environment has:	
	(c) Deviation from GES target ³ and/or national/ regional/sub-regional thresholds/EQS and/or (d) No data available.
Slight effects (2)	(a) Increased inputs of Total N and/or Total P into seawater but meeting GES targets ³ and/or national/ regional/sub-regional thresholds/EQS and/or (b) Increased concentrations of dissolved oxygen and/or chlorophyll in water column but meeting GES targets ³ and/or national/ regional/sub-regional thresholds/EQS.
Negligible effects (1)	(a) Decrease of inputs of Total N and/or Total P into seawater and meeting GES targets ³ and/or national/ regional/sub-regional thresholds/EQS and/or (b) Decreased concentrations of dissolved oxygen and/or chlorophyll in water column and meeting GES targets ³ and/or national/ regional/sub-regional thresholds/EQS.

7) For the evaluation of **contaminants** (including pollution from industries), either releases of hazardous substances into the hot spot area (in kg/year) or their concentration in water, biota or sediment need to be calculated or estimated.

The contaminants to be evaluated should consider SAP substances, pollutants covered by NBB 2008/2013 as well as the priority hazardous substances agreed by MEDPOL Focal points at their meeting held in Aix en Provence, France in November 2009 and listed in Annex II of Decision IG.21/3. A minimum common list of substances is the following:

- Metals and related compounds:
 - Chromium
 - Cadmium
 - Lead
 - Mercury
 - Organic tin compounds
 - Organic mercury compounds
 - Organic lead compounds
- Organohalogen compounds:
 - Polychlorinated Biphenyls (PCBs)
 - Polychlorinated dibenzodioxins (PCDDs)
 - Polychlorinated dibenzofurans (PCDFs)
- Organohalogenated pesticides/biocides:
 - Endosulphan
 - Hexachlorocyclohexane
 - Hexachlorobenzene
- Other organic compounds:
 - Diethylhexylphthalate (DEHP)
 - Phenolic compounds
 - Brominated flame retardants
 - Petroleum hydrocarbons, oils & greases
 - Polycyclic aromatic hydrocarbons

○ Short Chain Chlorinated Parafins

Each potential hot spot or sensitive area should be assessed regarding the most representative priority substance/s.

The following table describes the criteria for ranking the effects/risks, only one of the alternatives (a), (b), (c) or (d) needs to be met for assigning the related score. If different alternatives and different scores regarding the considered contaminants are possible, the precautionary principle should be applied and the worst scenario chosen. If no data are available, the category will be ranked as moderate effects (3).

Table 11. Ranking criteria for Contaminants category.

CONTAMINANTS	
Contaminants are introduced or were previously introduced at levels giving rise to:	
Severe effects (4)	(a) Significant increase of inputs of contaminants into seawater compared to previous year(s) and/or in the occurrences of acute pollution events and/or (b) Significant increase of contaminants concentrations in sediment and biota and/or in frequency of cases of seafood samples above regulatory limits for contaminants and/or (c) Significant deviation from GES target and/or national/ regional/sub-regional thresholds/EQS (e.g. regional ELV on Hg ⁴).
Moderate effects (3)	(a) Increase of inputs of contaminants into seawater compared to previous year(s) and/or (b) Increase of contaminants concentrations in sediment and biota and/or in frequency of cases of seafood samples above regulatory limits for contaminants and/or (c) Deviation from GES target and/or national/ regional/sub-regional thresholds/EQS (e.g. regional ELV on Hg) and/or (d) No data available.
Slight effects (2)	(a) Increased inputs of contaminants into seawater but meeting GES targets and/or national/ regional/sub-regional thresholds/EQS (e.g. regional ELV on Hg) and/or (b) Increased concentrations of contaminants in sediment and biota but meeting GES targets and/or national/ regional/sub-regional thresholds/EQS (e.g. regional ELV on Hg).
Negligible effects (1)	(a) Decrease of inputs of hazardous substances into seawater and meeting GES targets and/or national/ regional/sub-regional thresholds/EQS (e.g. regional ELV on Hg) and/or (b) Decreased concentrations of contaminants in sediment and biota and meeting GES targets and/or national/ regional/sub-regional thresholds/EQS (e.g. regional ELV on Hg).

8) **Marine litter** category addresses the effects of any solid materials discarded, disposed of or abandoned in the marine and coastal environment; solid waste from industrial sources is not

⁴ 50 µg/l by 2015 and 5 µg/l by 2019 (Decision IG 20/8.1).

addressed under this category.

The area to which this category applies is the area defined both in the Regional Plan on marine litter (Decision IG.21/7) and in Art. 3 of the LBS Protocol paragraphs (a), (c), and (d)⁵.

The following table describes the criteria for ranking the effects/risks, only one of the alternatives (a), (b) or (c) needs to be met for assigning the related score. If different scores are possible, the precautionary principle should be applied and the worst scenario chosen.

Table 12. Ranking criteria for Marine Litter category.

MARINE LITTER	
Properties and quantities of marine litter affect the coastal and marine environment:	
Severe effects (4)	(a) Significant increase of number of areas with accumulated marine litter in the coastal zone or up to 1 km close to the river mouth or run-off drainage system and/or (b) Significant increase of the amount of litter washed ashore and/or deposited on coastlines and/or (c) Illegal dump sites and/or non-sanitary landfills close (X Km) to the coastal area or river basin area.
Moderate effects (3)	(a) Increase of number of areas with accumulated marine litter in the coastal zone or up to 1 km close to the river mouth or run-off drainage system and/or (b) Increase of the amount of litter washed ashore and/or deposited on coastlines and/or (c) Illegal dump sites and/or non-sanitary landfills close (Y Km) to the coastal area or river basin area.
Slight effects (2)	(a) Maintained number of areas with accumulated marine litter in the coastal zone or up to 1 km close to the river mouth or run-off drainage system and/or (b) Maintained trends in the amounts of litter washed ashore and/or deposited on coastlines and/or (c) Illegal dump sites and/or non-sanitary landfills far from the coastal area or river basin area (Z km).
Negligible effects (1)	(a) Decreased trends in number of areas with accumulated marine litter in the coastal zone or up to 1 km close to the river mouth or run-off drainage system and/or (b) Decreased trends in the amounts of litter washed ashore and/or deposited on coastlines and/or (c) No illegal dump sites and/or non-sanitary landfills.

3.2.3.2. Criteria on “ECONOMICS”⁶

9) The following table describes the criteria for ranking the effects/risks on **economic activities** (and **ecosystem services** underpinning them), only one of the alternatives (a), (b) or (c) needs to be met

⁵ Article 3 of the LBS Protocol: (a) The Mediterranean Sea Area as defined in article 1 of the Convention;
(c) Waters on the landward side of the baselines from which the breadth of the territorial sea is measured and extending, in the case of watercourses, up to the freshwater limit;
(d) Brackish waters, coastal salt waters including marshes and coastal lagoons, and ground waters communicating with the Mediterranean Sea.

⁶ Further work is ongoing in the framework of ECAP regarding ecosystem services.

for assigning the related score. If different alternatives and different scores are possible, the precautionary principle should be applied and the worst scenario chosen.

Table 13. Ranking criteria for recreation and ecosystem services category.

<i>ECONOMIC ACTIVITIES AND UNDERPINING ECOSYSTEM SERVICES</i>	
severe effects (4)	(a) Area with a significant decrease in tourism and other recreational activities and/or it is a very important tourist area (>500,000 tourists annually) and/or (b) Severe effects on aquaculture or fisheries and/or close to a very important aquaculture and fisheries area (including spawning sites) and/or (c) Severe effects on provision of ecosystem services.
moderate effects (3)	(a) Area with a decrease in tourism and other recreational activities and/or it is an important tourist area (100,000 - 500,000 tourists annually) and/or (b) Moderate effects on aquaculture or fisheries and/or close to an important aquaculture and fisheries area and/or (c) Moderate effects on provision of ecosystem services.
slight effects (2)	(a) Tourism and other recreational activities are maintained and/or it is a tourist area between 10,000 – 100,000 tourists annually and/or (b) Slight effects on aquaculture or fisheries and/or relatively far from an aquaculture and fisheries area and/or (c) Slight effects on provision of ecosystem services.
negligible effects (1)	(a) Tourism and other recreational activities are increasing and/or it is a tourist area below 10,000 tourists annually and/or (b) Negligible effects on aquaculture or fisheries or no aquaculture and fisheries activities nearby and/or (c) Negligible effects on provision of ecosystem services.

10) The following table describes the criteria for ranking the **investment** needed for environmental sound solution of the potential hot spot:

Table 14. Ranking criteria for investment category.

<i>INVESTMENT</i>	
severe effects (4)	(a) Investment needed for environmental sound solution is estimated from X to Y million \$.
moderate effects (3)	(a) Investment needed for environmental sound solution is estimated from Y to Z million \$.
slight effects (2)	(a) Investment needed for environmental sound solution is estimated from Z to A million \$.
negligible effects (1)	(a) Minor investment is needed (below A million \$).

The specific ranges to be applied will depend on national circumstances.

3.2.3.3. Criteria on “TRANSBOUNDARY EFFECTS”

- 11) The following table describes the criteria for ranking the effects/risks on **transboundary effects**. For the evaluation of this category, a simple approach regarding the proximity to the borders can be used or, alternatively, the evaluation can be based on reference thresholds defined for the different categories of trans-boundary effects, i.e.: public health, marine biodiversity and habitats, economic activities such as fisheries and recreation and tourism. More details on the rationale, trans-boundary effects and thresholds are included in Annex III of this document.

Table 15. Ranking criteria for transboundary effects category.

TRANSBOUNDARY EFFECTS	
severe effects (4)	Area close to the borders directly affecting/discharging the Mediterranean sea and (a) Significant deviation from reference thresholds (Annex III) on: I. Public health (heavy metals and/or organic pollutants and/or population) and/or II. Fisheries and/or aquaculture (BOD and/or COD and/or TSS).
moderate effects (3)	Area close to the borders directly affecting the Mediterranean sea and (a) Moderate deviation from reference thresholds (Annex I) on: I. Public health (heavy metals and/or organic pollutants and/or population) and/or II. Fisheries and/or aquaculture (BOD and/or COD and/or TSS) and/or (b) Significant deviation from reference thresholds (Annex I) on: I. Marine biodiversity and habitats (nutrients and/or population) and/or II. Tourism and recreation.
slight effects (2)	Area close to the borders indirectly affecting the Mediterranean sea and (a) No deviation from reference thresholds on public health or fisheries (Annex I) and/or (b) Moderate deviation from reference thresholds on: I. Marine biodiversity and habitats (nutrients and/or population) and/or II. Tourism and recreation.
negligible effects (1)	Area far from the border with no direct/indirect effect.

3.2.4.Score and categorization of hot spots

All the potential pollution hotspots identified are scored against the categories and criteria presented in the previous sections and summarized in *Table 16*. The maximum score for an assessed pollution hotspot site is 108 points and the minimum is 27 points.

Table 16. Summary of categories, scores and multipliers.

Category	Multiplier	Score
Public health		

1) Population	4	1-4
2) Wastewater treatment	4	1-4
3) Drinking water quality	4	1-4
4) Bathing water quality	4	1-4
Environmental Status		
5) Organic matter	3	1-4
6) Nutrients	3	1-4
7) Contaminants	3	1-4
8) Marine litter	3	1-4
Economics		
9) Economic activities and ecosystem services underpinning them	2	1-4
10) Investment	2	1-4
11) Transboundary effects	1	1-4

Each potential hotspot is expressed within the following categories: A, B, C or D according to the range where the calculated total score falls:

Category	Weighted Total
Priority hot spot / sensitive area (A)	132 – 107
Hot spot /sensitive area (B)	106 – 82
Potential hot spot / Sensitive area (C)	81 – 58
No hotspot (D)	57 - 33

3.3. STEP 3: Guidance on the implementation of evaluation criteria and test example

The following sections describe the evaluation process along with relevant examples for the sites presented in *Table 17*.

3.3.1. Screening/compilation of a list of potential hot spots

For the initial list of potential sites, nation-wide data should be gathered from the following sources:

- a) PRTR (Pollutant Release and Transfer Register) data.
- b) Seawater, sediment and aquatic life monitoring data.
- c) Factory or industry emission permits.
- d) Information from local authorities (amounts of marine litter, bathing water quality, local emission sources, etc.).

Test example is presented on section 2.3.3

3.3.2. Assigning the category scores for each site

Determining the score for each category is notably dependent on local quality standards and on expert judgement. The evaluation can be performed according to the following principles:

(a) Population

This category refers to the size of the affected population and its distance from the potential hotspot. A geographic analysis has to be made to determine the nature of the secondary effects, the dispersion of polluting substances and the density of the population in terms of both permanent and temporary residents.

If different alternatives and different scores are possible, the precautionary principle should be applied and the worst scenario chosen.

(b) Wastewater Treatment

The following data can be used to aid the assessment of the wastewater treatment criteria:

- (a) Evidence of marine discharge of raw sewage, or minimally treated wastewater.
- (b) The frequency of overflows and leaks in the last years and the amount of wastewater discharged in these events will be evaluated in order to decide on the significance of the impact.
- (c) Examination of the pollution load from industrial sources obtained and untreated in WWTP (such as heavy metals). Will be determined by the concentration multi-year trends of pollutants leaving the WWTP.

(c) Drinking Water

The purpose of this category is to further prioritize sites that also pollute drinking water sources beside the Mediterranean seawater. For this category, local standards will be reviewed along with the general quality of the polluted water body to assess the impact of the potential hot spot.

(d) Bathing Water Quality

This category refers to frequent health risk in the bathing water and not one-time events. The number of events or instances of high pathogens in the water has to be assessed to determine the final score. For example – “severe effect” for beaches with constant high health risk, “moderate effect” for repeated to isolated events, and “slight effects” for occasional events of high pollution.

The following requirements should be met for sampling and analysis:

- (b) Minimum sampling frequency: at least one per month and not less than four in a bathing period including an initial one prior to the start of the bathing period.
- (c) For classification purposes at least 12 sample results are needed spread over 3-4 bathing seasons.
- (d) Reference method of analysis: ISO 7899-2 based on membrane filtration technique or any other approved technique.

(e) Organic Matter

Organic matter emission is first compared to GES standards, either local or regional. When these are no available standards, the emission can be rated according to comparable orders of magnitude.

For example: sites A and D are emitting around 400 tons of BOD every year while 20,000 tons are emitted every year in site B.

(f) Nutrients

Nutrients emission and seawater concentrations are first compared to available GES standards, either local or regional. When no specific values or other targets are available, the emission can be assessed by referring to all available data to determine the severity of the pollution.

Nutrients concentration are also affected by the characteristics of the location of discharge – for example, nutrients discharged in a partially enclosed bay are more prone to accumulate and spur eutrophication than nutrients discharged in open waters. For the final ranking, both local and regional chlorophyll concentration have to be considered, along with the magnitude of emission and its location and the distribution exists in the estuary.

For example: site A and site B might be discharging the same amount of nutrients, while the low dilution in the bay in which site B is located is causing high local nutrients and chlorophyll concentrations. High concentrations in site A are only measured near the outlet.

(g) Contaminants

Contaminants concentrations and emissions should be considered in the context of the types of emission sources in and around the potential hot-spots. When no knowledge of current concentration and loads is available, the evaluation will be based on a worst-scenario basis.

For example, the industrial emission in site B are not reported or monitored, but it is known that several industrial facilities exist in the area and are emitting an unknown load of metals and organic pollutants. In site D there are no known sources of industrial wastewater along the stream.

(h) Marine Litter

Marine litter category is based on local accounts. And refers to frequent and concentration of marine litter in the water and not one-time events. The number of events or instances of high concentration of marine litter has to be assessed to determine the final score. For example – “severe effect” for beaches

with constant high marine litter problem or close to emission source of waste, “moderate effect” for repeated to isolated events, and “slight effects” for occasional events of high pollution.

(i) **Economic activities and Underpinning Ecosystem Services**

The severity of the damage to local and regional economic activities (and ecosystem services underpinning them) can be assessed by relating to either recent trends in activity level or to nearby coastal area with similar characteristics.

(j) **Investment**

Fd

(k) **Transboundary effect**

To determine the transboundary effect first locates the emission source and determines the distance to the border. If there is a potential for pollutants transport across the border, the emission lines will be compared to the values listed in Appendix 1. Examine the severity of the deviation will use professional judgment and refer to both the number of parameters exceeding the threshold and the deviation of each parameter.

For example, a high deviation of a single parameter can be considered severe as a low deviation of number of parameters, depending on the toxicity of the pollutant.

3.3.3. Test example

In this section, four example sites are ranked based on both 2003 and updated criteria to compare the two methodologies’ results. The examples are described as follows:

- Site A – River mouth, sewage discharge from several small settlements upstream.
- Site B – Bay area, with a river mouth and sewage discharge upstream, major industries on the coast.
- Site C – site of a previous large-scale chemical factory that was discharging wastewater to the sea with no treatment. No information on historical pollutant loads.
- Site D – Outlet of a stream, large pastures and agricultural activity along the banks.

Table 17. Ranking of the four example sites according to updated criteria.

Updated categories	SITE A	SITE B	SITE C	SITE D	Multiplier
Public health					
Population	2	4	4	1	4
Wastewater treatment	4	4	4	1	4
Drinking water quality	1	1	1	1	4
Bathing water quality	3	4	1	2	4
Good Environmental Status					
Organic matter	2	4	3	2	3
Nutrients	2	4	4	4	3
Contaminants	1	4	4	1	3
Marine litter	1	3	1	1	3
Economics					
Economic activities (and ecosystem services underpinning them)	2	4	4	1	2

Investment	2	4	2	4	2
Transboundary Effects					
Transboundary Effects	1	1	1	1	1
Total Score	67	114	89	55	
Hot spot category	SENSITIVE (C)	HOT SPOT (A)	HOT SPOT (B)	NOT (D)	

To compare the current scoring to the 2003 results, the 2003 score field was normalized by multiplying the ratio between the 2003 score and the 2003 maximum score (29.4) with the current maximum score (132) as shown in *Table 19*.

Table 18. Ranking of the four example sites according to 2003 methodology.

Categories (2003)	SITE A	SITE B	SITE C	SITE D	Multiplier
Public health	1	4	3	1	1
Drinking water quality	5	2	1	1	0.9
Recreation	5	5	4	2	0.8
Other beneficial uses	2	4	1	2	0.8
Aquatic life including biodiversity	3	5	2	3	0.7
Economy and welfare including marine resources of economic value	3	6	4	4	0.7
Total Score	15.3	20.7	12.1	10	29.4
Normalized Score	68.7	92.9	54.3	44.9	132
Deviation from 2014 Score	-3%	18%	39%	18%	
Hot spot category (2003)	(C)	(B)	(D)	(E)	

As show in the examples above, four sites were examined based on 2003 methodology and updated criteria, and received a different score. Site C is the example presenting a major deviation between both methodologies due to the lack of historical data on pollution loads, which receives higher scores in updated criteria.

The main reason for differences in the other three example sites is the weight and the percentage effect of each of the categories affecting the total score. Figures below show the degree of influence of each of the categories in proportion to the total parameters for both 2003 and updated hot spot total scores. Public health shows now a higher contribution in the total score while economics a lower contribution. The rationale and description of particular adjustments made in 2014 with respect to 2003 for each category are further described in section 3.2.2.

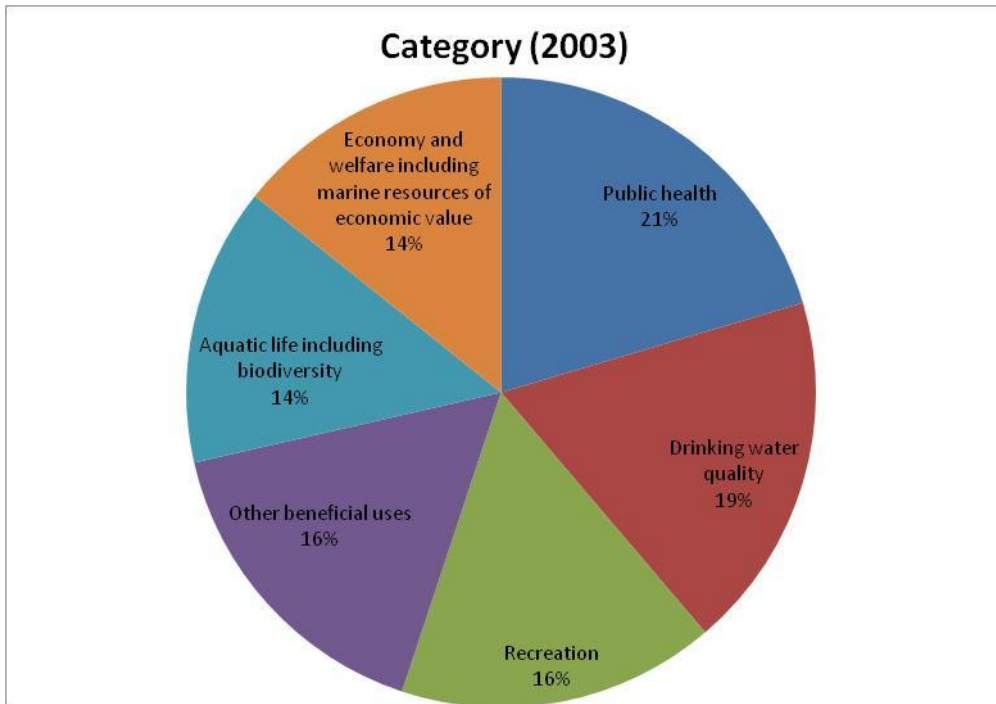


Figure 1. Contribution of 2003 categories in the total hot spot score (in percentages).

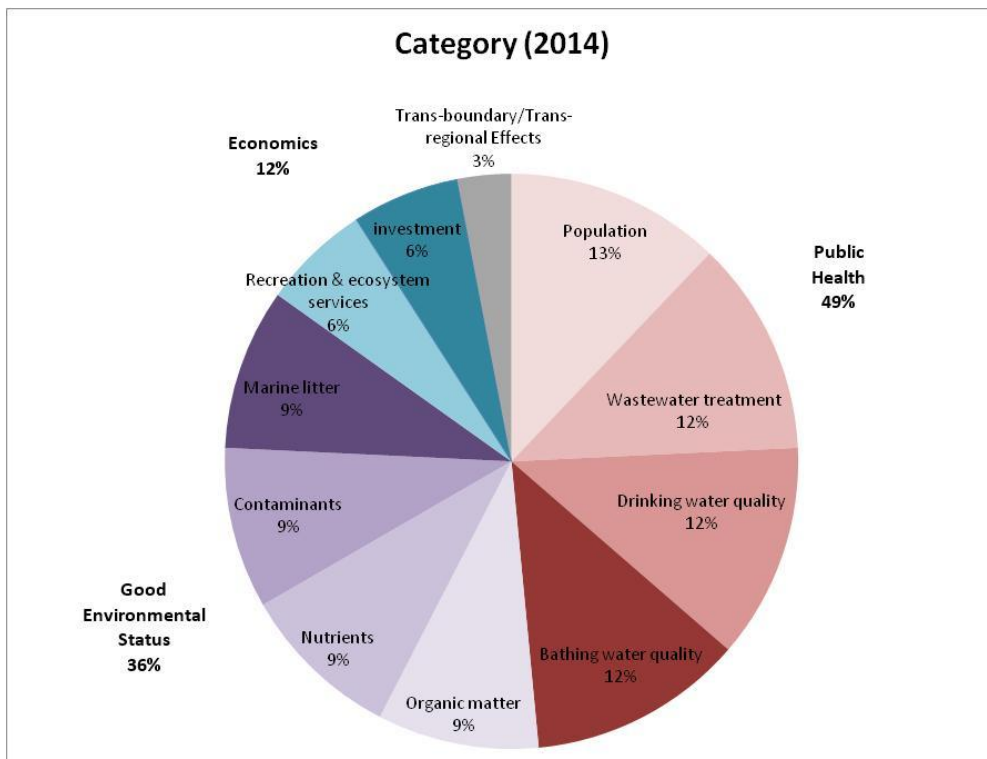


Figure 2. Contribution of updated criteria categories in the total hot spot score.

4. References

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Annex I: Summary of 2003 hot spot assessment and ranking criteria and methodology

<i>Public Health</i>	
<u>extreme effects</u> (6)	Domestic wastewater loads of more than 30 tons BOD/day with no disinfection and having a high probability of direct contact to human beings. Wastewater containing more than 50 mg/L of heavy metals and having a possible contact to the public at the discharge point. Wastewater containing radioactivity or hazardous substances above WHO limitation.
<u>severe effects</u> (5)	Domestic wastewater loads of more than 15 tons BOD/day with no disinfection and having a high probability of direct contact to human beings. Wastewater containing more than 20 mg/L of heavy metals and having a possible contact to the public at the discharge point.
<u>major effects</u> (4)	Domestic wastewater loads of more than 10 tons BOD/day with no disinfection and having a high probability of direct contact to human beings. Wastewater containing more than 10 mg/L of heavy metals and having a possible contact to the public at the discharge point.
<u>moderate effects</u> (3)	Domestic wastewater or water containing heavy metals with no direct effect to human beings.
<u>slight effects</u> (2)	Any discharge which contains toxic substances or pathogens and is not mentioned in (3) - (6).
<u>no effects</u> (1)	Discharge with no effect.

<i>Drinking Water Quality</i>	
<u>extreme effects</u> (6)	Any wastewater directly discharged to a water body which is used as drinking water.
<u>severe effects</u> (5)	Any wastewater directly discharged to a water body which is not used as drinking water but is potentially a drinking water source.
<u>major effects</u> (4)	Indirect discharges to water sources with improper filtration.
<u>moderate effects</u> (3)	Indirect discharges to a water body with proper infiltration.
<u>slight effects</u> (2)	Discharge representing a potential risk in emergency situations (flood, earthquake).
<u>no effects</u> (1)	Discharge with no effect.

<i>Recreation</i>	
<u>extreme effects</u> (6)	Discharges with more than 300 mg/L of oil which may cause a significant odour that directly affects a recreational area from a distance of 100 m.
<u>severe effects</u> (5)	Discharges which may cause a significant odour that directly affects a recreational area from a distance of 500 m.
<u>major effects</u> (4)	Discharges with no odour at a distance of 1000 m from the recreational area deteriorating the aesthetic quality of waters.
<u>moderate effects</u> (3)	Discharges at a distance of 5000 m from the recreational area.
<u>slight effects</u> (2)	Discharges causing a potential risk to the environment.
<u>no effects</u> (1)	No effect.

<i>Other Beneficial Uses</i>	
<u>extreme effects</u> (6)	Discharges containing a high level of solid wastes or odours which can cease the present beneficial use of the water body (transportation, sport activities, aquaculture).
<u>severe effects</u> (5)	Discharges containing a high level of solid wastes or odours which can potentially cease the present beneficial use of the water body (transportation, sport activities, aquaculture).
<u>major effects</u> (4)	Discharges containing a high level of solid wastes or odours which can harm the present beneficial use of the water body (transportation, sport activities, aquaculture).
<u>moderate effects</u> (3)	Discharges containing a high level of solid wastes or odours which can potentially harm the present beneficial use of the water body (transportation, sport activities, aquaculture).
<u>slight effects</u> (2)	Discharges containing a high level of solid wastes or odours which may harm the present beneficial use of the water body (transportation, sport activities, aquaculture).
<u>no effects</u> (1)	Discharge with no effect.

<i>Aquatic Life (including biodiversity)</i>	
<u>extreme effects</u> (6)	Any discharge which may reduce the oxygen content of the receiving body below 0.5 mg O ₂ /L. Any discharge which contains a heavy metal concentration of more than 50 mg/L. Any discharge which contains an oil concentration of 400 mg/L.
<u>severe effects</u> (5)	Any discharge which may reduce the oxygen content of the receiving body below 1 mg O ₂ /L. Any discharge which contains a heavy metal concentration of more than 30 mg/L. Any discharge which contains an oil concentration of 200 mg/L.
<u>major effects</u> (4)	Any discharge which may reduce the oxygen content of the receiving body below 2 mg O ₂ /L. Any discharge which contains a heavy metal concentration of more than 20 mg/L. Any discharge which contains an oil concentration of 100 mg/L.
<u>moderate effects</u> (3)	Any discharge which causes oxygen depletion.
<u>slight effects</u> (2)	Any suspicious discharge.
<u>no effects</u> (1)	Discharge with no effect.

<i>Economy and Welfare</i>	
<u>extreme effects</u> (6)	Shutting down of discharging industries would have significant effect on the economy. Investment needed for environmental sound solution more than 20 million dollars.
<u>severe effects</u> (5)	Shutting down of discharging industries would have severe effect on the economy. Investment needed for environmental sound solution more than 10 million dollars.
<u>major effects</u> (4)	Shutting down of discharging industries would have major effect on the economy. Investment needed for environmental sound solution more than 5 million dollars.
<u>moderate effects</u> (3)	Discharging industries having little effect on the economy.
<u>slight effects</u> (2)	Discharging industries having no effect on the economy.
<u>no effects</u> (1)	Discharging industries having no effect on the economy, and already non-feasible for investment.

With regards to **transboundary effects**, the criteria to be used and the rationale suggested were as follows:

- (a) Public health: it is considered that the main transboundary risk that could arise is the potential pollution and contamination of edible fish and shellfish which would eventually enter the human food chain and have an impact on human health. The risk of transboundary effects on human health due to pollutants containing persistent chemicals and heavy metals would be significant

should the release of the pollutant be greater than 1/10 of the upper level specified in data supplied in the past related to national pollution hot spots (MAP Technical Reports Series No. 124, Table III-3). The following figures show there is a significant risk of adverse transboundary effects on human health, when the loads related to the specific pollutants listed below are greater than the referred levels:

a.	Hg >	128 kg/year	rounding	130 kg/year
b.	Cd >	260 kg/year	rounding	260 kg/year
c.	Pb >	427 kg/year	rounding	430 kg/year
d.	Cr >	1,140 kg/year	rounding	1,140 kg/year
e.	Cu >	2,540 kg/year	rounding	2,540 kg/year
f.	Zn >	31,317 kg/year	rounding	31,000 kg/year
g.	Oil >	3,483 kg/year	rounding	3,500 kg/year

The specific pollutants listed above were addressed because relevant data was available.

Another factor is the population pressure, which through the discharge of wastewater may have an adverse effect on human health. Discharges would carry a significant risk should the population exceed 1,000,000 inhabitants. If a wastewater treatment facility exists, then a correction factor of 1/10 should be introduced. When multiplied by the actual population, this correction factor provides the actual figure to be considered (e.g. if the population equivalent is 2,000,000 inhabitants and the city is equipped with a wastewater treatment facility, then the population to be considered in order to arrive at the potential risk of adverse effects, is: $2,000,000 \times 1/10 = 200,000$ inhabitants). If the final figure is less than 1,000,000, then there is no significant risk of transboundary effects as a result of the discharge.

- (b) Marine biodiversity and habitats: the factors to be examined are pressure of human population (which should be considered on the same basis as for human health) and releases of phosphorus and nitrogen into the marine environment. These discharges show there is an elevated risk to marine biodiversity and habitats due to the formation of algal blooms as a result of releases of P and N and also to chemical pollutants (persistent organic pollutants, heavy metals, etc.) that usually accompany these discharges and which have a significant impact, according to the total pollution load discharged. Data provided on releases of P and N into the marine environment should be compared to the figures published in MAP Technical Reports Series No. 109 (page 11, table 2.3). These figures are an estimate of the total P and N pollution loads discharged into the Mediterranean. Considering there are about 100 pollution hot spots (the exact number is reported as 103 in MAP Technical Reports Series No. 124), which constitute a significant release of pollution into the sea, a considerable effect would result should the above loads exceed 1/100. To be precise, the total P release is referred to as being 57,000 t/year and the figure to be used for comparison would be $57000/100 = 570$ t/year. The same formula applies to the total release of N = $200,000/100 = 2,000$ t/year.

When the above figures are used to indicate the potential risk of transboundary effects, the person responsible for recording the data should indicate what, in his opinion, is the cause of the transboundary effect. This could prove a valuable source of information, especially when coming from a variety of different, and sometimes unknown places. A further element that could be considered is the existence of a hot spot in an area listed in the IUCN inventory of protected areas (link: <http://www.wcmc.org.uk/cgi-bin/padb.p>) and under the SPA list of protected areas.

- (c) Fisheries: discussion of criteria to be used for fisheries led to the conclusion that significant factors that would lead to a risk of adverse transboundary effects would be BOD, COD and TSS. Based

on the same formula used for the calculation of phosphorus and nitrogen, 1/100 of the total value of pollution loads related to BOD, COD and TSS (MAP Technical Reports Series No. 109, table 2.3) are 1500 t/y, 4500 t/y and 300 t/y, respectively. The relation between these parameters was considered when proposing the above values.

When reckoning pollutant loads the values should be multiplied by a factor of 10 if the area (the marine pollution hot spot) is considered by the national or local authorities as a nursery ground. For example, if the actual load related to BOD is 1200 t/year and the area is considered by the national authorities as a nursery ground, then the load to be considered is $1200 \text{ t/year} \times 10 = 12,000$, which exceeds the value of 1500 t/year and results in a significant risk of transboundary effect. If the area is not considered as a nursery ground for fisheries, then the risk would be non significant as the value of 1200 t/year is less than 1500 t/year.

- (d) Recreation and tourism: the factors to be considered are recreation, tourism and cultural heritage. The risks of adverse effects of transboundary significance should be translated as depriving the public of a common shared good. The significance of risk due to recreation should be evaluated by the national authorities of each country, based on available recreational facilities. The significance of risk resulting from tourism should be based upon the experience gained by the competent authorities of each country and the relevant justification provided. Finally, the significance of risk to cultural heritage should be based on the existence of sites of value in each country. Inventories of such sites are available from internationally and regionally recognized organizations and institutions (UNESCO and the Mediterranean Centre of One Hundred Historic Sites). Lists include the 'World Heritage List' (link: <http://www.unesco.org/whc/heritage.htm>) and a list of 'Mediterranean Hundred Historic Sites'.

Nature of Investment and Economic Costs

The identification of the previous hot spots was necessarily linked to the identification of the causes and the problems that led to this critical situation. Therefore it was essential that a determination of the nature of investment, based on the causes identified and the intervention to be followed were required and a preliminary estimated financial requirement be proposed, taking into consideration the costs involved for similar projects in the particular country. The same should also be followed for the new pollution hot spots areas to be included in the national lists.

Annex II: Main definitions and criteria established by different international agreements

	UNEP/MAP	WB, 2011	UFM, 2013	OSPAR	HELCOM
Hot spot	<p>(a) Point sources on the coast of the Mediterranean Sea which potentially affect human health, ecosystems, biodiversity, sustainability or economy in a significant manner.</p> <p>(b) Defined coastal areas where the coastal marine environment is subject to pollution from one or more point or diffused sources on the coast of the Mediterranean which potentially affect human health in a significant manner, ecosystems, biodiversity, sustainability or economy.</p>	A coastal area where the environment is subject to pollution due to intense human activities regardless of their location and source, which potentially affect public health, threaten biodiversity, degrade ecosystem services and put at risk the prospects for sustainable development both on the spot but also in a wider area.	A pollution source impacting the Mediterranean, not only a point source (including river basin as well)	-	Defined by a set of criteria for different point and non-point sources of pollution affecting the coastal environment. Three types: (i) point source municipal and industrial hot spots; (ii) non-point source agricultural hot spots; and (iii) coastal lagoon and wetland hot spots, which include selected coastal areas. (<i>HELCOM, 1999</i>).
Sensitive area	As defined in second part of hot spot definition (b).	NA	NA	Potential problem area (eutrophication): Those areas for which there are reasonable grounds for concern that the anthropogenic contribution of nutrients may be causing or may lead in time to an undesirable disturbance to the marine ecosystem due to elevated levels, trends and/or fluxes in such nutrients.	Nitrogen sensitive areas

	UNEP/MAP	WB, 2011	UFM, 2013	OSPAR	HELCOM
				Problem area (eutrophication): Those areas for which there is evidence of an undesirable disturbance to the marine ecosystem due to anthropogenic enrichment by nutrients.	
Endangered areas	-	A coastal area that is in danger of becoming a pollution hotspot in the future due to existing human activities, but it still cannot be classified as such in accordance to the coastal pollution hotspot definition	-	-	-
Good Environmental Status (GES)	The environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations. <i>(Decision 21.3 ECAP)</i>	-	<i>Based on Decision 21.3 ECAP</i>	<i>In line with Directive 2008/56/EC</i>	<i>In line with Directive 2008/56/EC</i>
Hot spot assessment criteria	The risk exerted by the point sources for six categories is graded from 1 (no effects) to 6 (extreme effects) and multiplied by importance coefficients:	The pollution hotspots are scored against the following category/criteria graded from 1 to 10 : Category: Target Population	Proposed criteria for the update of UNEP/MAP assessment: 1) Amount of	-	Procedures for hot spots types (i) and (ii) were based on the following three key steps: Step 1: Quantify the site's threat

	UNEP/MAP	WB, 2011	UFM, 2013	OSPAR	HELCOM
	<ul style="list-style-type: none"> - public health (1.0) - drinking water quality (0.9) - recreation (0.8) - other beneficial uses (0.8) - aquatic life (including biodiversity) (0.7) - economy and welfare (including marine resources of economic value) (0.7) 	<ul style="list-style-type: none"> - Population size Category: Public Health - Risks from wastewater - Risks from solid waste - Risks from other contaminants Category: Economy Value - Tourism importance - Aquaculture and fisheries importance Category: Biodiversity and Ecosystem services - Risks from eutrophication - Presence of invasive species - Sensitivity of natural environment Category: Trans-boundary (TB) and Trans-regional (TR) effects - TB and TR effects 	<p>pollutants discharged from a single outlet to the Mediterranean Sea (industrial or municipal).</p> <p>2) Extent of pollution discharged in comparison with national or international standards.</p> <p>3) The trans-boundary impact of various types of pollutants.</p> <p>4) The origin of the pollution.</p>		<p>and impact on the Baltic Sea based on high and/or significant amounts of polluting substances.</p> <p>Step 2: Check the compliance of the site with Annexes of the Helsinki Convention, relevant HELCOM Recommendations and other relevant international agreements.</p> <p>Step 3: Develop an initial analysis of the site/area and source(s) to be addressed, remediation/implementation costs, and clean-up or management goals.</p> <p>Additional considerations were particularly established regarding municipal hot spots and industrial hot spots.</p> <p>Procedures for hot spots type (iii) were based on the following two key steps:</p> <p>Step 1: Analyse status and trends. Step 2: Analyse the Status of the Management Plan and Implementation Experience</p>
Hot spot categorisation	<p>Maximum score: 29.4</p> <p>Minimum score: 4.9</p> <p>Five categories of hot spots: A, B, C, D, E</p>	<p>Maximum score: 100</p> <p>Minimum score: 10.</p> <p>The sites scored in the upper quartile (>69 points) are considered priority pollution hotspot sites.</p>	-	-	<p>Three types of hot spots:</p> <ul style="list-style-type: none"> (i) point source municipal and industrial hot spots; (ii) non-point source agricultural hot spots; and (iii) coastal lagoon and wetland

	UNEP/MAP	WB, 2011	UFM, 2013	OSPAR	HELCOM
					hot spots, which include selected coastal areas.

Annex III: Reference thresholds and criteria for evaluation of transboundary effects

Public health: it is considered that the main transboundary risk that could arise is the potential pollution and contamination of edible fish and shellfish which would eventually enter the human food chain and have an impact on human health. The risk of transboundary effects on human health due to pollutants containing persistent chemicals and heavy metals would be significant should the release of the pollutant be greater than 1/10 of the upper level specified in data supplied in the past related to national pollution hot spots (MAP Technical Reports Series No. 124, Table III-3). The following figures show there is a significant risk of adverse transboundary effects on human health, when the loads related to the specific pollutants listed below are greater than the referred levels:

a.	Hg > 128 kg/year	rounding	130 kg/year
b.	Cd > 260 kg/year	rounding	260 kg/year
c.	Pb > 427 kg/year	rounding	430 kg/year
d.	Cr > 1140 kg/year	rounding	1140 kg/year
e.	Cu > 2540 kg/year	rounding	2540 kg/year
f.	Zn > 31317 kg/year	rounding	31000 kg/year
g.	Oil > 3483 kg/year	rounding	3500 kg/year

The specific pollutants listed above were addressed because relevant data was available.

Another factor is the population pressure, which through the discharge of wastewater may have an adverse effect on human health. Discharges would carry a significant risk should the population exceed 1,000,000 inhabitants. If a wastewater treatment facility exists, then a correction factor of 1/10 should be introduced. When multiplied by the actual population, this correction factor provides the actual figure to be considered (e.g. if the population equivalent is 2,000,000 inhabitants and the city is equipped with a wastewater treatment facility, then the population to be considered in order to arrive at the potential risk of adverse effects, is: $2,000,000 \times 1/10 = 200,000$ inhabitants). If the final figure is less than 1,000,000, then there is no significant risk of transboundary effects as a result of the discharge.

Marine biodiversity and habitats: the factors to be examined are pressure of human population (which should be considered on the same basis as for human health) and releases of phosphorus and nitrogen into the marine environment. These discharges show there is an elevated risk to marine biodiversity and habitats due to the formation of algal blooms as a result of releases of P and N and also to chemical pollutants (persistent organic pollutants, heavy metals, etc.) that usually accompany these discharges and which have a significant impact, according to the total pollution load discharged. Data provided on releases of P and N into the marine environment should be compared to the figures published in MAP Technical Reports Series No. 109 (page 11, table 2.3), see Annex III. These figures are an estimate of the total P and N pollution loads discharged into the Mediterranean. Considering there are about 100 pollution hot spots (the exact number is reported as 103 in MAP Technical Reports Series No. 124), which constitute a significant release of pollution into the sea, a considerable effect would result should the above loads exceed 1/100. To be precise, the total P release is referred to as being 57,000 t/year and the figure to be used for comparison would be $57000/100 = 570$ t/year. The same formula applies to the total release of N = $200,000/100 = 2,000$ t/year.

When the above figures are used to indicate the potential risk of transboundary effects, the person responsible for recording the data should indicate what, in his opinion, is the cause of the transboundary effect. This could prove a valuable source of information, especially when coming from a variety of different, and sometimes unknown places. A further element that could be

considered is the existence of a hot spot in an area listed in the IUCN inventory of protected areas (link: <http://www.wcmc.org.uk/cgi-bin/padb.p>) and under the SPA list of protected areas.

Fisheries: discussion of criteria to be used for fisheries led to the conclusion that significant factors that would lead to a risk of adverse transboundary effects would be BOD, COD and TSS. Based on the same formula used for the calculation of phosphorus and nitrogen, 1/100 of the total value of pollution loads related to BOD, COD and TSS (MAP Technical Reports Series No. 109, table 2.3) are 1500 t/y, 4500 t/y and 300 t/y, respectively. The relation between these parameters was considered when proposing the above values.

When reckoning pollutant loads the values should be multiplied by a factor of 10 if the area (the marine pollution hot spot) is considered by the national or local authorities as a nursery ground. For example, if the actual load related to BOD is 1200 t/year and the area is considered by the national authorities as a nursery ground, then the load to be considered is 1200 t/year x 10 = 12,000, which exceeds the value of 1500 t/year and results in a significant risk of transboundary effect. If the area is not considered as a nursery ground for fisheries, then the risk would be non significant as the value of 1200 t/year is less than 1500 t/year.

Recreation and tourism: the factors to be considered are recreation, tourism and cultural heritage. The risks of adverse effects of transboundary significance should be translated as depriving the public of a common shared good. The significance of risk due to recreation should be evaluated by the national authorities of each country, based on available recreational facilities. The significance of risk resulting from tourism should be based upon the experience gained by the competent authorities of each country and the relevant justification provided. Finally, the significance of risk to cultural heritage should be based on the existence of sites of value in each country. Inventories of such sites are available from internationally and regionally recognized organizations and institutions (UNESCO and the Mediterranean Centre of One Hundred Historic Sites). Lists include the 'World Heritage List' (link: <http://www.unesco.org/whc/heritage.htm>) and a list of 'Mediterranean Hundred Historic Sites'.

Table 19. Ranking criteria for transboundary effects category.

Category of transboundary effect criteria	Factors	Levels
Public Health	(a) <u>Heavy Metals</u> Hg	130 kg/year
	Cd	260 kg/year
	Pb	430 kg/year
	Cr	1,140 kg/year
	Cu	2,540 kg/year
	Zn	31,000 kg/year
	(b) <u>Organic Pollutants:</u> Oil	3,500 kg/year
	(c) <u>Population</u>	1,000,000*
Marine Biodiversity and Habitats	(a) <u>Nutrients</u> Phosphorus (P)	570 t/year

Category of transboundary effect criteria	Factors	Levels
	Nitrogen (N)	2,000 t/year
	(b) <u>Population</u>	1,000,000*
Fisheries	BOD	1,500 t/year**
	COD	4,500 t/year**
	TSS	300 t/year**
Recreation and Tourism	Recreation	Existence of recreational areas
	Tourism	If adverse effect exists
	Cultural Heritage	Existence of properties of cultural heritage

* If a wastewater treatment facility exists, then the population considered should be that resulting from the actual population multiplied by 1/100.

** If the local or national authorities consider the area as a nursery ground, then the loads to be considered should be that resulting from the actual loads multiplied by a factor of 10.