UNITED NATIONS

UNEP

EP

UNEP/MED WG.563/7

United Nations
Environment Programme
Mediterranean Action Plan

Distr.: General
20 April 2023

Original: English

Meeting of the MED POL Focal Points

Athens, Greece, 24-26 May 2023

Agenda item 5: Assessment of Marine and Coastal Environment

New/Updated IMAP Assessment Criteria for Nutrients, Contaminants and Marine Litter.

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UNEP/MAP
Athens, 2023

Note by the Secretariat

In line with Decision IG.23/6 related to 2017 Mediterranean Quality Status Report (MED QSR) adopted at COP 20 (Tirana, Albania, December 2017), the Contracting Parties and the Secretariat are encouraged to test the following updated assessment criteria for indicative purposes in the different contexts that exist in the Mediterranean: i) BAC and EAC for trace metals (Cd, Hg, Pb) in sediments and in biota (mussel and fish); ii) BAC for PAHs in biota (mussel); iii) EAC for organochlorinated compounds in sediments; and iv) BAC and EAC for biomarkers in mussel. In addition, the Decision IG.23/6 maintained the following assessment criteria as endorsed by Decisions IG.22/7 (Athens, Greece, February 2016): i) EAC for sediments and mussel; ii) EAC for a group of organochlorinated compounds in sediments and biota (mussel and fish) complementing updated values; iii) BACs and EACs for biomarkers in mussel, complementing updated values; and iv) the coastal water types reference conditions and boundary values.

In line with the Programme of Work 2020-2021 adopted by COP21 (Naples, Italy, December 2019) and the Programme of Work 2022-2023 adopted by COP22 (Antalya, Türkiye, December 2021), and conclusions of the Meeting of the Ecosystem Approach Correspondence Group on Pollution Monitoring (Podgorica, Montenegro, 2 - 3 April 2018), the MED POL Programme undertook further actions aimed at harmonization and standardization of the monitoring and assessment methods related to IMAP Pollution and Marine Litter Cluster (Activity 2.4.1.4), including the upgrade of several assessment criteria.

The newly available monitoring data were used to update sub-regional Mediterranean BAC values for heavy metals in biota and sediments in 2019 (UNEP/MED WG.463/Inf.6) in order to contribute to the preparation of the State of Environment and Development Report 2019 (SoED). Thenceforth, the initial proposals of the upgraded assessment criteria for contaminants, as well as the proposal of methodological approaches for setting the reference conditions and boundary values for Dissolved Inorganic Nitrogen (DIN) and Total Phosphorous (TP) in relevant sub-areas, were reviewed by the Meeting of the Ecosystem Approach Correspondence Group on Pollution Monitoring– CorMon Pollution that was held from 26 – 28 April 2021, and thereafter by the Meeting of MED Pol Focal Points held on 9 July 2021. Considering the evolving nature of the assessment criteria update, the values of assessment criteria for contaminants as calculated in 2021, as well as the methodological approaches for nutrients, were approved for their use as a basis for the development and testing of the methodologies for GES assessment of Ecological Objectives 5 and 9. The 8th EcAp Coordination Group (9 September 2021) took note of the progress achieved with the understanding that there is a validation process with CorMon, and on that understanding, recommended to continue building on such achieved results towards development and testing of the methodologies for GES assessment related to Ecological Objectives 5 and 9 within the preparation of the inputs for the 2023 MED QSR.

Following up on the consultations with the CPs which took place within the Online Working Groups (OWG) on Contaminants and Eutrophication, the new and updated assessment criteria related to contaminants; and Chl*a* and nutrients in the Adriatic Sea Sub-region, were reviewed and approved by the Meeting of the Ecosystem Approach Correspondence Group on Pollution held on 27 and 30 May 2022, as provided in UNEP/MED WG.533/10, Annex III, Appendices 1 and 2. These values of the assessment criteria were applied for the preparation of the IMAP Pollution assessments within the 2023 Mediterranean Quality Status Report.

For Marine Litter (IMAP EO10), the first Baseline Values (BV) for IMAP Common Indicators 22 (beach macro-litter) and 23 (seafloor macrolitter and floating microplastics) (IMAP CI23) were adopted by COP19 in 2016 through Decision IG.22/10. Further to the 2016 values, the Secretariat is undertaking a revision for entire IMAP EO10 with data deriving from the national monitoring programmes for marine litter. Thus far, COP22 in 2021 through Decision IG.25/9 adopted the updated values for IMAP CI22 (beach macro-litter), and currently there is a process for updating the respective values also for IMAP

CI23 (i.e., seafloor macrolitter and floating microplastics). The first review iteration took place during the CorMon Marine Litter Meeting held in Athens, Greece on 3 March 2023. Further to the review comments as well as the conclusions and recommendations of the said Meeting, the Secretariat updated the document by validating, proof checking and adding new datasets from a number of Contracting Parties taking into consideration the "non-deterioration" approach for seafloor macrolitter. While in this document the respective values for marine litter are summarized, more detailed information can be found under the list of information documents which was prepared for this Meeting.

Further to the conclusion of the Meeting of the Ecosystem Approach Correspondence Group on Pollution Monitoring (27 and 30 May 2022) and the Meeting of the Ecosystem Approach Correspondence Group on Marine Litter Monitoring (3 March 2023), the working document UNEP/MED WG.563/7 is submitted to the present Meeting of the MED POL Focal Points with a view of endorsing integration of the following assessment criteria for the future Decision related to the 2023 MED QSR be submitted to COP23 to be held in December 2023:

a) The new Background Concentrations (BC) and Background Assessment Concentrations (BAC) for IMAP Common Indicator 17, as provided in Tables 4 to 8;
b) Further alignment of the list of EAC values for IMAP Common Indicator 17 with the sources originally used i.e., Long et al. (1995) and OSPAR (2009), as provided in Tables 10 to 11;
c) The Mediterranean EAC values for CI 20 which are based on the maximum regulatory levels for certain contaminants in foodstuffs included in EC/EU Directives 1881/2006, 1259/2011 and amendments 488/2014 and 1005/2015, as provided in Tables 12 to 14;
d) The new and updated reference conditions and boundary values of Chl*a*, TP and DIN for the Adriatic Sea Sub-region coastal and open (offshore) waters, along with the two updates of the names of water types to ensure consistency of the assessment criteria included in Decision 22/7 with the classification included in Commission Decision 2013/480/EU, as provided in Table 3;
e) Approval of the possible approaches for future upgrade of EAC for IMAP Common Indicators 17 and 18; and
f) Approval of the updated Baseline Values (BV) and Threshold Values (TV) for IMAP Common Indicator 23 (i.e., seafloor macro-litter and floating microplastics) as provided in Table 20.

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Annex I: References

List of Abbreviations / Acronyms

ADR	Adriatic Sea sub-region
AEL	Aegean and Levantine Seas sub-region
B	Biota
BAC	Background Assessment Concentration
BC	Background Concentration
BDL	Below Detection Limit
BV	Baseline Values
CEN	Central Mediterranean Sea sub-region
Chl *a*	Chlorophyll a
CI	Common Indicator
CM	Central Mediterranean
COP	Conference of the Parties
CORMON	Correspondence Group on Monitoring
CP	Contracting Party
CRM	Certified Reference Material
DIN	Dissolved Inorganic Nitrogen
DRY WT	Dry weight
EAC	Environmental Assessment Criteria
EC	European Commission
EM	Eastern Mediterranean
EMODnet	European Marine Observation and Data Network
EO	Ecological Objective
ERL	Effect range low
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FDil	Dilution factor
GES	Good Environmental Status
G_*mean*	Geometric mean
G/M	Good/Moderate Boundary
HCB	Hexachlorobenzene
H/G	High/Good Boundary
IMAP	Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria
Log	Logarithm
MAP	Mediterranean Action Plan
MB	*Mullus barbatus*
MED	Mediterranean
MED POL	Programme for the Assessment and Control of Marine Pollution in the Mediterranean Sea
MED QSR	Mediterranean Quality Status Report
MG	*Mytilus galloprovincialis*
MSFD	Marine Strategy Framework Directive
NOAA	National Oceanic and Atmospheric Administration
OSPAR	Convention for the Protection of the Marine Environment for the North- East Atlantic
OWG	Online Working Group
PAHs	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl

List of Abbreviations / Acronyms (continued)

TP	Total Phosphorous
QSR	Quality Status Report
Q	Percentile
RC	Reference conditions
S	Sediments
TP	Total Phosphorous
TRIX	Trophic index
TV	Threshold Value
SoED	State of Environment and Development Report
TM	Trace metals
TOC	Total Organic Carbon
UNEP	United Nations Environmental Program
USEPA	United States Environmental Protection Agency
WFD	Water Framework Directive
WHO	World Health Organization
WM	Western Mediterranean
WMS	Western Mediterranean Sea sub-region
WT	Water type
WET WT	Wet weight

1 Introduction

Contaminants:

1. The present document provides the new and updated assessment criteria for IMAP Common Indicators 17 and 20, as included in the document UNEP/MED WG.533/10, Annex III, Appendix 1. This document was approved by the Meeting of CorMon Pollution (27 and 30 May 2022) further to the consideration and revision of document UNEP/MED WG.533/3.

2. The updated criteria for IMAP Common Indicator 17 include the new Background Concentrations (BCs) and Background Assessment Concentrations (BACs) using data as reported from the CPs in a few iterations by December 2021. The criteria established by Decisions IG.22/7 [1] (COP 19) and IG. 23/6 (COP 20) [2] were reviewed, and further to an in-depth analysis of the data available for the present upgrade of the assessment criteria, the new upgraded regional and sub-regional Mediterranean BC and BAC values were provided for CI17.

3. The Environmental Assessment Criteria (EAC) values cannot be updated for CI 17 based on the existing mandatory monitoring data as established by IMAP for this indicator. Further to the approval provided by the Meeting of CorMon Pollution (27 and 30 May 2022), this document also provides the methodological approach for future work on setting the Mediterranean EACs for CI 17 based on a very specific in-depth research of the ecotoxicological and environmental scientific literature. It also includes a few updates of EAC values included in Decisions IG.23/6 and IG.22/7, to ensure their alignment with the sources originally used i.e., Long et al. (1995) and OSPAR (2009).[3]

4. The present document also provides a proposal of the Mediterranean Environmental Assessment Criteria for IMAP Common Indicator 20 based on the maximum regulatory levels for TMs (Cd, Hg and Pb) and organic contaminants (PCBs, PAHs and dioxin) in foodstuffs as provided in EC/EU Directive 1881/2006, and its amendments 835/2011, 1259/2011, 488/2014 and 1005/2015.

5. The BACs and EACs for IMAP Common Indicator 18, as established by Decisions IG.22/7 and IG. 22/7 were not upgraded given the lack of any data reported.

Eutrophication:

6. The present document provides the new and updated assessment criteria for IMAP Common Indicators 13 and 14 in the Adriatic Sea Sub-region, as included in the document UNEP/MED WG.533/10, Annex III, Appendix 2 which was approved by the Meeting of CorMon Pollution (27 and 30 May 2022) further to consideration and revision of the documents UNEP/MED WG.533/4. The new and updated criteria are related to the reference conditions and G/M boundary values expressed as annual *G_mean* for Chl*a*, TP, DIN only in the Adriatic Sea Sub-region coastal and open (offshore) waters. It also provides a few updates of Decision IG.22/7 to ensure consistency of the assessment criteria with the classification as provided in Commission Decision 2013/480/EU.

7. The data used for developing updated assessment criteria for CIs 13 and 14, and CI 17 were collected in the IMAP Pilot Info System during its testing phase, and in particular after launching a formal

[1] UNEP/MAP (2015). Decision IG.22/7 on Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria (Annex II), (COP 19, 2015).
[2] UNEP/MAP (2017). Decision IG.23/6 on Mediterranean Quality Status Report (COP20, 2017).
[3] Long, E., D. Macdonald, S. Smith and F. Calder (1995). "Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments." Environmental Management **19**(1): 81-97, OSPAR Commission, Agreement number 2009-2. Agreement on CEMP Assessment Criteria for the QSR 2010. Publication number 2009/461.

call for reporting of monitoring data in June 2020, as well as monitoring data stored in MED POL database that have not been previously used for calculation of the assessment criteria for the assessments undertaken in 2017 and 2019. Subsequently, since 2015 data were considered even if previously used, following the recommendations of the Online Working Groups on Eutrophication and Contaminants. Data from the EU data center (European Marine Observation and Data Network - EMODnet) were also taken into account, as a reliable external data source, as well as data collected from the scientific literature. A detailed compilation of the available data is given in documents UNEP/MED WG.533/10, Annex III, Appendix 1 and Appendix 2; and UNEP/MED WG.533/Inf.3.

Marine Litter:

8. The present document also provides, the updated assessment criteria for marine litter (IMAP EO10) and its Common Indicators 22 and 23. In particular, provides the updated Baseline Value (BV) and the established Threshold Value (TV) for IMAP CI22 (beach macro-litter) as adopted by COP 22[4], and the proposed BV and TV for IMAP CI23 (i.e., floating microplastics and seafloor macro-litter), further to the review of the CorMon Marine Litter Meeting (Athens, Greece, 3 March 2023).

2 The updated assessment criteria for nutrients and Chlorophyll *a*

9. Due to nitrogen/phosphorus limitations present in the Mediterranean (i.e., restricted measurements of Dissolved Inorganic Phosphorous - DIP), as well as the limited data availability and related demanding statistics, it was possible to calculate and/or update the reference conditions and the Good/Moderate (G/M) boundary values, expressed as annual *G_mean* for Chl*a*, TP, DIN, only in the Adriatic Sea Sub-region coastal and open (offshore) waters.

10. The new and updated criteria for the Adriatic Sea Sub-region coastal and open (offshore) waters, as approved by the Meeting of CorMon Pollution (27 and 30 May 2022), are shown in Table 1. They were applied for GES assessment of the Adriatic Sea Sub-region within the preparation of the 2023 MED QSR.

Table 1. Reference conditions and G/M boundary values as annual *G_Mean* for Chl*a*, TP, and DIN for the Adriatic Sea Sub-region Type I and Type II-A Adriatic coastal and open (offshore) waters.

Water type	**Boundaries**	**Coastal waters**		**Open (offshore) waters**	
		***c*(Chl*a*)/µg L^{-1}**	***c*(TP)/µmol L^{-1}**	***c*(Chl*a*)/µg L^{-1}**	***c*(DIN)/µmol L^{-1}**
WT I (in the Adriatic Sea Sub-region)	RC	1.4[b]	0.19[a]	0.15*; 0.29**	0.21*; 0.66**
	G/M	5.0[a]	0.55[a]	3.1	22.3
WT II-A Adriatic	RC	0.33[b]	0.16[a]	0.11	-
	G/M	1.5[b]	0.48[a]	-	-
**for ME; **for CRO, IT* *[a]From Giovanardi et al, 2018; [b]G/M boundaries for Chla as approved in IG.22/7*					

11. For open (offshore) waters, the new assessment criteria for Chl*a* and DIN were calculated. For coastal waters, the assessment criteria for Chl*a* remain as adopted in IMAP Decision IG.22/7, with the exception of the boundary G/M value for Chl*a* which was introduced from Giovanardi et al. (2018). The reference conditions and boundary G/M values for TP in coastal waters were also introduced from Giovanardi et al. (2018).

[4] Decision IG.25/9 - Amendments to the Regional Plan on Marine Litter Management in the Mediterranean in the Framework of Article 15 of the Land Based Sources Protocol (COP22, Antalya, Türkiye, 7-10 December 2021).

12. A note should also be taken of the two following corrections of the names of water types to ensure consistency of the assessment criteria as provided in Decision 22/7 with the classification as provided in Commission Decision 2013/480/EU:

a) Type II -FR-SP, as included in Decision IG.22/7, was replaced with Type II -A-FR-SP;
b) Type II-A Tyrrhenian replaced Type II-B Tyrrhenian, since Type-II-B does not exist in the Tyrrhenian Sea.

13. Following the same approach used for Water Type (WT) I and Water type II-A Adriatic waters, the overall *G_means* of nutrients' concentrations were related to the concentration of Chl*a* for Water Type III W-Adriatic waters. No correlation was found both for TP (R^2<0.01; P=0.732) and DIN (R^2=0.05; P=0.093). Overall values of *G_mean* of Chl*a* range from around 0.1 to around 0.4 µg/L. Given that the ecological classification scheme consists of five ecological quality classes, the discrimination limit between the two contiguous Chl*a* annual *G_mean* values would not allow for proper and safe classification (Giovanardi *et al*., 2018). Therefore, the boundary values for WT III-W Adriatic waters, as approved by the Meeting of CorMon Pollution (27 and 30 May 2022), are based on the H/G values for WT II-A Adriatic in coastal waters i.e. 0.64 µg/L for Chl*a* and 0,26 µmol/L for TP.

14. It should be noted that for open (offshore) waters, TRIX values for Water type I (WT I) have never reached values higher than 5.5 indicating that processes of advanced eutrophication are not underway in the Adriatic Sea Sub-region. For WT II-A Adriatic, data show that in the open (offshore) waters, the assimilation processes (TRIX up to 5) are not present indicating their oligotrophic character.

15. For further upgrades of the assessment criteria, i.e. reference conditions (RCs) and boundary values for DIN, TP and Chl*a*, as a minimum, the following datasets need to be reported by the CPs: three continuous years of monitoring with a minimum monthly frequency for WT I and WT II-A and bimonthly to seasonal for WT III. It should also be noted that other supporting parameters (i.e. temperature, salinity and dissolved oxygen) need to be available for defining the water typology.

16. The new and updated RC and G/M boundary values are valid for the Adriatic Sea Sub-region only. There is a need for urgent reporting of new and all pending monitoring data by the Contracting Parties to IMAP Info System for the other three Mediterranean sub-regions, i.e. the Western Mediterranean Sea Sub-region (WMS), the Central Mediterranean Sea Sub-region (CEN) and the Aegean and Levantine Seas (AEL) Sub-region. It is a prerequisite for decision - making on the application of the tools and methods that will be found optimal for the calculation of the RCs and boundary values in these three sub-regions. This complex task needs to be undertaken under the leadership of the Contracting Parties, including through the Online Working Group (OWG) for Eutrophication (EO5), as recommended by the Meetings of CorMon on Pollution Monitoring. Meanwhile, the assessment criteria for the CEN, WMS and AEL sub-regions remain as endorsed by Decision 22/7.

17. Table 2 shows the major water types as provided by Decision IG 22.7. Table 3 provides an update of the assessment criteria, as provided in IG 22.7, illustrating the new values calculated for the Adriatic Sea-Subregion, as well the two corrections as explained in paragraph 15.

Table 2. Major coastal water types in the Mediterranean

	Type I	**Type II-A, II-A Adriatic**	**Type III-W**	**Type III-E**	**Type Island-W**
σt (density)	<25	25<d<27	>27	>27	All ranges
S (salinity)	<34.5	34.5<S<37.5	>37.5	>37.5	All ranges

Note: With the view to assess eutrophication, it is recommended to rely on the classification scheme on Chl a concentration (in µg/l) in coastal waters as a parameter easily applicable by all Mediterranean countries based on the indicative thresholds and reference values presented in Table 3.
Note: The above table of major coastal water types is also indicative of the part of offshore waters next to coastal waters; however, it should be used with caution in the offshore (open) areas.

Table 3. Coastal water types reference conditions and boundary values in the Mediterranean, along with the new and updated values for coastal and open (offshore) waters in the Adriatic Sea Sub-region.
(Shaded cells indicate the criteria which remain as provided in Decision IG.22/7. Reference conditions and boundary (Good/Moderate status) values, expressed as G_mean annual values, are based on long time series (>5 years) of monthly sampling at least, which differ from type to type on the sub-regional scale, and therefore, were built with different strategies).

	Coastal waters					
	Reference conditions of *c*(Chl*a*) (µg/L)		**Boundaries of *c*(Chla) (µg/L) for G/M status**		**Reference conditions of *c*(TP) (µmol/L)**	**Boundaries of *c*(TP) (µmol/L) for G/M status**
Water Typology	*G_mean*	90% percentile	*G_mean*	90% percentile		
Type I	1,4	3,33[b]	6,3	10		
Type I Adriatic	1,4	3,94	5,0[a]	14,1	0,19 [a]	0,55 [a]
Type II-A-FR-SP[d]	-	1,9	-	3,58	-	-
Type II-A Adriatic	0,33	0,87	1,5	4,0	0,16 [a]	0,48 [a]
Type II-A[e] Tyrrhenian	0,32	0,77	1,2	2,9	-	-
Type III-W Adriatic[c]	-	-	0,64[f]	1,7[f]	-	0,26
Type III-W Tyrrhenian	-	-	0,48	1,17	-	-
Type III-W-FR-SP		0,9		1,80		
Type III-E		0,1		0,4		
Type Island-W		0,6		1,2-1,22		

	Open (offshore) waters in the Adriatic Sea Sub-region					
	Reference conditions of *c*(Chl*a*) (µg/L)		**Boundaries of *c*(Chl*a*) (µg/L) for G/M status**		**Reference conditions of *c*(DIN) (µmol/L)**	**Boundaries of *c*(DIN) (µmol/L) for G/M status**
Water Typology	*G_mean*	90 % percentile	*G_mean*	90 % percentile		
Type I Adriatic	0,15[g]; 0,29[h]	0,42[f]; 0,81[g]	3,1	8,7	0,21[g]; 0,66[h]	22.3
Type II-A Adriatic	0.11	0.29	-	-	-	-
Type III-W Adriatic [c]	-	-	0.64	1.7	-	-

[a] *From Giovanardi et al, 2018*
[b] *Applicable to Golf of Lion Type I coastal waters*
[c] *The ecological classification scheme would not be suitable for proper and safe classification, and therefore the boundary values for WT III-W Adriatic waters are based on the H/G values for WT II-A Adriatic in coastal waters i.e. 0.64 µg/L for Chla and 0,26 µmol/L for TP*
[d] *Correction of error included to ensure consistency with the classification as provided in Commission Decision 2013/480/EU i.e. Type II -FR-SP, as included in Decision IG.22/7, replaced with Type II -A-FR-SP*
[e] *Correction of error included to ensure consistency with the classification as provided in Commission Decision 2013/480/EU i.e., Type II-A Tyrrhenian replaced Type II-B Tyrrhenian, as included in Decision IG.22/7, since the latter does not exist in the Tyrrhenian Sea*
[f] *values based on the H/G values for WT II-A*[c] *The ecological classification scheme would not be suitable for proper and safe classification, and therefore the boundary values for WT III-W Adriatic waters are based on the H/G values for WT II-A Adriatic in coastal waters i.e. 0.64 µg/L for Chla and 0,26 µmol/L for TP*
[g] *for ME;* [h] *for HR, IT*
[h] *No pressure – effect relationship was found, and therefore RC for DIN and boundary G/M values for Chla and DIN could not be proposed.*

3 The updated assessment criteria for IMAP Common Indicator 17

3.1 The Updated BC and BAC values for IMAP Common Indicator 17

18. Deriving and setting up the assessment criteria to determine environmental status is not an easy task. It gets more complicated going from the local to sub-regional and regional assessments. While there are many methodologies to derive criteria, the first step is aimed at defining the background or reference conditions from which to measure/determine the status and trends. In the framework of UNEP/MAP (UNEP/MAP 2016, 2019), the background concentration (BC) is defined as "The concentration of a contaminant at a "pristine" or "remote" site based on contemporary or historical data." The BC of anthropogenic (man-made) substances was defined as zero. The same definitions are used by OSPAR and the Marine Strategy Framework Directive (MSFD) based on the Water Framework Directive (WFD) (Tornero et al. 2019).[5]

19. The calculation of BC values is the first step for the derivation of indicators that are defined as the measure, index, or model used to estimate the current state and future trends, along with thresholds for possible management action. The BCs for CI 17 were derived using the following two methodologies: i) data from sediment cores compiled from the scientific literature (UNEP/MAP 2011),[6] and ii) data from the MED POL database (UNEP/MAP 2011, 2016, 2019). A complete explanation of the used methodologies, including the specific methodologies used by UNEP/MAP for the different parameters, is given in previous UNEP/MAP documents (UNEP/MAP 2011, 2016, 2019), as well as in UNEP/MED WG.533/10, Annex III, Appendix 1 and UNEP/MED WG.533/Inf.3.

20. BAC values are the concentrations below which no deterioration of the environment can be expected. Observed concentrations are said to be near BC if the mean concentration is statistically significantly below BAC. For the calculation of BAC values from BC concentrations, UNEP/MAP adopted the methodology that corresponds to the OSPAR methodology.[7] The BAC values were computed as the BC concentration multiplied by a factor that was determined based on the uncertainty (precision and accuracy) of the determinations. Detailed elaboration is provided in UNEP/MED WG.533/10, Annex III, Appendix 1 and UNEP/MED WG.533/Inf.3.

21. The MedBAC values endorsed in Decisions IG.22/7 and IG.23/6 were as follows: MedBAC for TM in sediments, mussel and fish (Tables 1 and 3 of UNEP/MED WG.533/10, Annex III, Appendix 1), PAHs in sediments and mussel (Tables 2 and 4 of UNEP/MED WG.533/10, Annex III, Appendix 1). In 2019, the same methodology was used to propose the derivation of specific sub-regional MedBAC values. Further to work undertaken in 2019, the regional and sub-regional BAC values were updated in 2022, using the same methodology applied for the previous update.

22. The new data critically analyzed (UNEP/MED WG.533/10, Annex III, Appendix 1 and UNEP/MED WG.533/Inf.3) were used to update the BC and BAC values for the sub-regions of the

[5] Additional definitions for BC can be found in the literature and are explained in UNEP/MED WG.533/Inf.3

[6] For the purpose of this document only the scientific elements have been considered from any reference included in this document. Legal considerations are out of the scope of the present document, which serves exclusively scientific purposes.

[7] At present, no statistical assessment was possible for the precision of the monitoring data reported into IMAP Info system given the quantity of data reported, as well as a frequency of analyzing one sample of either biota or sediments is insufficient for calculation of the precision of monitoring data. Therefore, the variability from OSPAR monitoring program was used, following its application for an upgrade of the assessment criteria in 2017 and 2019. A detailed explanation is given in section 2.3.1 of the information document UNEP/MAP WG.533/Inf.3.

Mediterranean and for the whole Mediterranean Sea, as provided in Tables 4 to 8, by using the same methodology as initially applied in 2016/2017 and replicated in 2019.[8]

23. BAC values for trace metals were calculated by multiplying the BCs by a factor as follows: i) MedBAC=1.5 x MedBC (for mussel and sediments matrices); ii) MedBAC=2.0 x MedBC (fish).

24. For Polycyclic Aromatic Hydrocarbons (PAHs) in sediments and mussel (*M. galloprovincialis)*, BAC values were calculated as follows: MedBAC=1.5 x MedBC.[9]

25. When most of the data originated from one sub-region, or there were significant differences among the sub-regions, the BC values were calculated for sub-regions and not for the whole Mediterranean.

26. It was noted that in some instances there was a large variability (up to > 100%) on BACs values between the values re-calculated in 2017, 2019 and 2022. Therefore, it was recommended by the Meeting of CorMon (1-2 March 2023) that when deciding on the use of threshold for GES assessment, this variability should be taken into account for each sub-region.

27. The reporting of new data from CPs to the IMAP-IS allowed for the calculation of the new BC and BAC values for PAHs in the mussel (*M. galloprovincialis).* As for sediments, data with BDL values were used in the calculation of the new BCs. The BDL values were different, depending on the country and even different within the same country. Moreover, BDL values constituted 12% to 90% of the data points depending on the compound.[10] This could be the one reason for the differences in BACs between sub-regions.

28. The Meeting of CorMon Pollution also agreed to add the concentration of the Sum of (16) PAHs to the list of parameters in addition to reporting the concentrations of individual 16 PAHs, given it was included in Data Dictionaries as the mandatory parameter for CI 17.

29. The reporting of new data from CPs to the IMAP-IS allowed for the calculation of BACs for organochlorinated contaminants (IMAP addresses PCBs and pesticides within organochlorinated contaminants) in sediments and *M. galloprovincialis*. The BACs used for organochlorinated contaminants are based on the detection limits of the methods used and their uncertainty (precision and accuracy), as determined from CRMs (Certified reference materials) and proficiency testing.

30. These new BC and BAC values for IMAP CI 17, as revised and approved by the Meeting of CorMon Pollution (27 and 30 May 2022) (UNEP/MED WG.533/10, Annex III, Appendix 1), are presented here-below in Tables 4 to 8.

[8] The calculation was performed using also the limit of detection (LOD) or the limit of quantitation (LOQ) values provided by the countries, addressed as below detection limit (BDL) values (see Annexes I and III in UNEP/MAP WG.533/Inf.3).
[9] The calculation of the multiplication factor to calculate BACs for PAHs in sediments was not provided in the previous UNEP/MAP documents (2011, 2016, 2019). Looking at the OSPAR values for BC and BAC for PAHs in the sediments, the multiplication factor used depended on the compound and ranged from 1.6 to 2.1.
[10] See Annex III in UNEP/MAP WG.533/Inf 3.

Table 4. New updated BC and BAC values for trace metals in sediments calculated from data available for upgrade of the criteria, as approved by the Meeting of CorMon Pollution (27 and 30 May 2022). The units of concentration are given in µg/kg dry wt, as requested by IMAP.

New updated BC and BAC values for trace metals in sediments					
New updated BC values (2022) in sediments, µg/kg dry wt					
TM	MED	WMS	ADR	CEN	AEL
Cd	107	140	120	#	78.9
Hg	50.0	90.0	50.0	#	31.5
Pb	15000	16000	15700	1805	15674
New updated BAC values (2022) in sediments, (µg/kg dry wt)					
	Med	WMS	ADR	CEN	AEL
Cd	161	210	180	#	118
Hg	75.0	135	75.0	#	47.3
Pb	22500	24000	23550	2708	23511
*#All data points for Cd are **BDL** as well as 72% of the Hg data points.*					

Table 5. New updated BC and BAC values for Polycyclic Aromatic Hydrocarbons **(**PAHs) in sediments calculated from data available for upgrade of the criteria, as approved by the Meeting of CorMon Pollution (27 and 30 May 2022). The units of concentration are given in µg/kg dry wt, as requested by IMAP.

New updated BC and BAC values for Polycyclic Aromatic Hydrocarbons (PAHs) in sediments					
	Updated BC values (2022) in sediments, µg/kg dry wt				
PAH compounds	MED	WMS	ADR	CEN	AEL
Naphthalene	2.00	8.0	2.0	#	2.3
Acenaphthylene	(1.0)[#]	#	#	0.4	#
Acenaphthene	(2.0)[#]	#	#	*	#
Fluorene	(2.0)[#]	#	#	0.4	#
Phenanthrene	3.10	14.9	3.5	0.8	3.1
Anthracene	(2.2)[#]	#	#	#	#
Fluoranthene	5.00	#	7.0	0.1	2.7
Pyrene	6.20	24.8	8.0	0.4	3.0
Benzo[a]anthracene	3.38	19.7	4.1	*	1.8
Chrysene	2.70	35.9	4.6	1.6	1.6
Benzo(b)fluoranthene	5.00	8.7	15.0	*	2.6
Benzo(k)fluoranthene	4.00	#	3.0	*	#
Benzo[a]pyrene	(4.0)[#]	#	4.0	#	1.0
Benzo[g,h,i]perylene	(4.2)[#]	#	5.7	*	1.8
Dibenz[a,h]anthracene	(1.0)[#]	7.0	#	*	#
Indeno[1,2,3-c,d]pyrene	(4.0)[#]	#	4.4	*	2.1
Sum PAHs	27.4	160	41.0	6.3	21.4
	Updated BAC values (2022) in sediments, µg/kg dry wt				
PAH compounds	MED	WMS	ADR	CEN	AEL
Naphthalene	3.0	12.0	3.0	#	3.5
Acenaphthylene	(1.5)[#]	#	#	0.6	#
Acenaphthene	(3.0)[#]	#	#	*	#
Fluorene	(3.0)[#]	#	#	0.5	#
Phenanthrene	4.7	22.4	5.3	1.2	4.7
Anthracene	(3.3)[#]	#	#	#	#
Fluoranthene	7.5	#	10.5	0.2	4.1
Pyrene	9.3	37.1	12.0	0.6	4.5

New updated BC and BAC values for Polycyclic Aromatic Hydrocarbons (PAHs) in sediments					
Benzo[a]anthracene	5.1	29.6	6.2	*	2.7
Chrysene	4.0	53.9	6.9	2.4	2.4
Benzo(b)fluoranthene	7.5	13.0	22.5	*	3.8
Benzo(k)fluoranthene	6.0	#	4.5	*	#
Benzo[a]pyrene	(6.0)#	#	6.0	#	1.5
Benzo[g,h,i]perylene	(6.3)#	#	8.6	*	2.7
Dibenz [a,h]anthracene	(1.5)#	10.5	#	*	#
Indeno[1,2,3-c,d]pyrene	(6.0)#	15.0	6.5	*	3.2
Sum PAHs	41.0	240	61.5	9.5	32.0

*#most data (>50%) below detection limit, * no data reported*

Table 6. New updated BC and BAC values for trace metals in mussel (*M. galloprovincialis*) and fish (*M. barbatus*) calculated from data available for upgrade of the criteria, as approved by the Meeting of CorMon Pollution (27 and 30 May 2022). The units of concentration are given as requested by IMAP.

New updated BC and BAC values for trace metals in mussel soft tissue (*M. galloprovincialis*), µg /kg dry wt					
New updated BC values (2022)					
TM	**MED**	**WMS**	**ADR**	**CEN**	**AEL**
Cd	710	1030	629	*****	942>
Hg	77.9	85.0	75.4	*****	110>
Pb	1100	1260	1000	*****	2300>
New updated BAC values (2022)					
TM	**MED**	**WMS**	**ADR**	**CEN**	**AEL**
Cd	1065	1545	944	*****	1413>
Hg	117	128	113	*****	165>
Pb	1650	1890	1500	*****	3450>

** Only a few data points were available for the CEN. The calculated BCs were lower than in other sub-regions, however, the few data are not representative of the CEN.*
> Since new data were not available in the AEL to update BC/BAC values for M. galloprovincialis, it was approved to use the values calculated in 2019.

New updated BC and BAC values for trace metals in fish muscle *(Mullus barbatus*), µg/kg wet wt					
New updated BC values (2022)					
TM	**MED**	WMS	ADR	CEN	AEL
Cd	3.9	*	5.3	*	3.6
Hg	40.6	*	120	*	33.7
Pb	18.3	*	40.8	*	13.5
New updated BAC values (2022)					
	MED	WMS	ADR	CEN	AEL
Cd	7.8	*	10.6	*	7.2
Hg	81.2	*	240	*	67.4
Pb	36.6	*	81.6	*	27.0

** Given the lack of data, it was not possible to propose values for BC in these sub-regions, therefore it was approved to use the regional MED BC values for the GES assessment*

Table 7. New BC and BAC values for Polycyclic Aromatic Hydrocarbons **(**PAHs) in mussel (*M. galloprovincialis)* calculated from data available for upgrade of the criteria, as approved by the Meeting of CorMon Pollution (27 and 30 May 2022). The unit of concentration is given in µg/kg dry wt, as requested by IMAP. No data were available for the CEN and the AEL Sub-regions.

New BC and BAC values for Polycyclic Aromatic Hydrocarbons (PAHs) in mussel (*M. galloprovincialis)*, µg/kg dry wt			
New BC values (2022)			
	MED	WMS	ADR
Naphthalene	0.56	0.52	#
Acenaphthylene	(0.05)[#]	#	#
Acenaphthene	(0.50)[#]	#	#
Fluorene	2.50	7.87	#
Phenanthrene	5.35	19.9	2.25
Anthracene	1.12	0.94	#
Fluoranthene	4.83	10.0	#
Pyrene	2.50	5.54	#
Benzo[a]anthracene	0.60	0.69	#
Chrysene	2.54	2.98	#
Benzo(b)fluoranthene	1.00	1.36	#
Benzo(k)fluoranthene	1.00	0.73	#
Benzo[a]pyrene	(1.00)[#]	0.94	#
Benzo[g,h,i]perylene	1.00	0.67	#
Dibenz[a,h]anthracene	(0.10)[#]	#	#
Indeno[1,2,3-c,d]pyrene	(0.63)[#]	0.29	#
Sum 16 PAHs[11]	5.80	5.60	6.60
New BAC values (2022)			
	MED	WMS	ADR
Naphthalene	0.84	0.79	#
Acenaphthylene	(0.08)[#]	#	#
Acenaphthene	(0.75)[#]	#	#
Fluorene	3.75	11.8	#
Phenanthrene	8.03	29.8	3.38
Anthracene	1.68	1.40	#
Fluoranthene	7.25	15.0	#
Pyrene	3.75	8.31	#
Benzo[a]anthracene	0.90	1.04	#
Chrysene	3.81	4.46	#
Benzo(b)fluoranthene	1.50	2.04	#
Benzo(k)fluoranthene	1.50	1.09	#
Benzo[a]pyrene	(1.50)[#]	1.42	#
Benzo[g,h,i]perylene	1.50	1.01	#
Dibenz[a,h]anthracene	(0.14)[#]	#	#
Indeno[1,2,3-c,d]pyrene	(0.94)[#]	0.43	#
Sum 16 PAHs	8.70	8.40	9.90

[#]most data (>50%) below detection limit;

[11] Data dictionary gives 2 additional categories: Sum 4 PAHs Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene) and Sum 5 PAHs (Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(ghi)perylene, Indeno(1,2,3-cd)pyrene). It is suggested that they be considered for use in the future data reporting.

Table 8. New BAC values for organochlorinated contaminants (PCBs and pesticides) in sediments and mussel (*M. galloprovincialis*), calculated from data available for upgrade of the criteria, as approved by the Meeting of CorMon Pollution (27 and 30 May 2022). The unit of soncentrations is given in µg/kg dry wt, as requested by IMAP. For sediments, very limited data were available for the CEN sub-region, while for biota no data were available for the CEN and AEL sub-regions. When most (>50%) of the data points were below the detection limit for the sub-regions, BACs were not calculated.

New BAC values (2022) for organochlorinated contaminants (PCBs and pesticides) in sediments and mussel (*M. galloprovincialis*)					
SEDIMENTS, µg/kg dry wt	MED	WMS	ADR	CEN	AEL
PCBs					
PCB28	0.10	#	#	#	0.09
PCB52	0.07	0.10	0.09	#	0.04
PCB101	0.10	0.16	0.16	*	#
PCB118	0.10	0.46	0.18	#	0.01
PCB138	0.11	0.26	0.24	#	#
PCB153	0.14	0.40	0.28	#	0.02
PCB180	0.09	0.13	0.13	#	#
Sum 7 PCBs	0.40	1.60	0.21	#	0.19
Pesticides					
γ-HCH (Lindane)	(0.1)#	#	#	*	0.02
DDE(p,p')	(0.1)#	0.23	#	#	*
Hexachlorobenzene	(0.1)#	#	#	#	*
Dieldrin	(0)#		#	#	#
BIOTA – MG, µg/kg dry wt	MED	WMS	ADR	CEN	AEL
PCBs					
PCB28	0.20	0.07	1.38	*	*
PCB52	0.38	0.3	0.5	*	*
PCB101	1.20	1.1	1.4	*	*
PCB118	1.23	1.5	1.4	*	*
PCB138	2.31	2.4	3.3	*	*
PCB153	3.45	4.6	4.6	*	*
PCB180	0.50	0.3	0.5	*	*
Sum 7 PCBs	18.4	28.6	17.3	*	*
Pesticides					
γ-HCH (Lindane)	(1.0)#	#	#	*	*
DDE(p,p')	3.05	3.05	*	*	*
Hexachlorobenzene	(0.5)#	#	#	*	*
Dieldrin	(1.0)#	#	*	*	*

*# most data (>50%) below detection limit. * no data reported*

31. For an update of BC and BAC values for CI 17, the following key findings were approved by the Meeting of CorMon Pollution (27 and 30 May 2022):

- For some parameters there is a marked difference among the Mediterranean sub-regions. Therefore, it is proposed in those cases (i.e., Cd and Hg in sediments, Cd in *M. galloprovincialis*, sum of PAHs in sediments), to consider using the sub-regional Mediterranean Sea assessment criteria.
- A statistical treatment of BDL concentrations has been recommended by OWG on Contaminants (paragraph 36 and section 4.1. of UNEP/MED WG.533/10, Annex III, Appendix 1). It is recognized that the different BDL values make it hard to use half of the BDL concentration for these values. However, it is unreasonable to exclude BDL values from the consideration. Within

the present update of the criteria, the calculations were performed with the BDL values as reported by the countries.

- An in-depth examination of more data points that need to be reported by the CPs should be performed in particular when large differences are observed between the BC values calculated in 2016, 2019, 2021 and 2022. This is true for TM in sediments and biota in all sub-regions. The examination should include, among others, characterization of the stations used (hotspot, reference, other) as required for mandatory data reporting regarding CI 17 to IMAP-IS, analytical methodology, normalization, and temporal trends. The reporting of the new data to IMAP-IS up to 31 December 2021, improved the recalculation of the upgraded BCs that were provided in 2021.
- The reporting of new data to IMAP-IS made it possible to calculate BCs for PAHs in biota, and BACs for organochlorinated contaminants in sediments and biota, which was impossible in the previous UNEP/MAP documents from 2016, 2019 and 2021. However, many of the data points are BDLvalues and more data need to be reported to improve the recalculation of BCs. Before new data availability will allow their recalculation, the present re-calculated values remain in use for preparing assessment inputs for the 2023 MED QSR.

3.2 An upgraded approach for updating the Environmental Assessment Criteria (EAC) values for IMAP CI 17

32. EAC values are the concentrations above which significant adverse effects on the environment or human health are most likely to occur. Conversely, EAC values are defined as the concentrations below which it is unlikely that unexpected or unacceptable biological effects will occur in exposed marine species. Given it was impossible to develop EACs specific for the Mediterranean, it was agreed to use the criteria developed by OSPAR and NOAA/USEPA (ERL values) (Long et al. 1995), as the EAC values for the Mediterranean. The EAC values agreed in Decisions IG.22/7 and IG.23/6 are as follows: EAC values for TM, PAHs and organochlorinated contaminants (PCBs and pesticides) i.e., NOAAs ERLs (for TM, PAH and pesticides in sediments) and the ECs from EU Directives to protect human health (for TM and organic contaminants in biota).

33. The EAC values for TM in biota as endorsed by Decisions IG.22/7 and IG.23/6 are the concentrations in fish and seafood recommended as dietary limits for human consumption concerning human health (EC), derived from the following EU Directives regulating maximum levels for certain contaminants in foodstuffs: EC/EU 1881/2006 and amendment 629/2008. EAC values for organic contaminants (PAHs and organochlorinated contaminants) in mussels were taken from OSPAR.[12]

34. It must be noted that the EAC values set up to protect human health may be too lenient to protect the Mediterranean Sea if the goal is to achieve and maintain GES where the contaminants cause no significant impact on coastal and marine ecosystems. However, EAC values for CI 17 cannot be updated based on existing monitoring data. It needs very specific in-depth research of the ecotoxicological and environmental scientific literature.

35. Therefore, the methodology detailed in the European Commission Guidance Document (2018) and in Long et al. (1995) was recommended by the Meeting of CorMon Pollution (27 and 30 May 2022) for an update of Mediterranean EAC values. It includes a thorough examination of the scientific literature conducted to study where data on no effect or adverse biological effects are given in conjunction with chemical data in the environment and in the biota at the same site and time. Those include but are not

[12] OSPAR Commission, Agreement number 2009-2. Agreement on CEMP Assessment Criteria for the QSR 2010. Publication number 2009/461. CEMP: 2008/2009 Assessment of trends and concentrations of selected hazardous substances in sediments and biota. Publication number 2009/390. OSPAR QSR 2000-Chapter 4.

limited to sediment toxicity tests, aquatic toxicity tests in conjunction with equilibrium partitioning (EqP) and field and mesocosm studies. The data should be assembled into a detailed database and analyzed, as well as the extent of the effect determined. The emphasis should be given to Mediterranean biota species.

36. Upgrade of the EAC values for the Mediterranean Sea is a long-term task that needs dedicated, very specific, scientific research (more detailed elaboration is provided in UNEP/MED WG.533/Inf 3). Meanwhile, the EAC values as endorsed for TM (Cd, Hg and Pb) and organic contaminants (PAHs, PCBs and pesticides) in Decisions IG.22/7 and IG.23/6 will continue to be applied in the Mediterranean. They are shown here-below in Tables 9 to 11.

37. Further to the gaps identified within the preparation of the IMAP Pollution Assessments of the 2023 MED QSR, it is necessary to further align the list of EAC values included in Decisions IG.23/6 and IG.22/7 with the sources originally used (i.e., Long et al., 1995, OSPAR, 2009.[13]) The following slight updates are included in:

a) Table 10: The new EAC values were added for the following PAHs: i) Naphthalene; Acenaphthylene; Acenaphthene Fluorene; Dibenz [a,h]anthracene and Sum16 PAHs in sediments and ii) Naphthalene in biota.
b) Table 11: The new EAC value is added for Sum 7 PCBs in sediments. The EAC value of 11.5 µg/kg dry wt in Decision IG 22/7 originated probably from Long et al. (1995) as explained in document UNEP/MED 427/Inf.3.[14] However, Long et al. (1995) presents the ERL value of 22.7 µg/kg dry wt for Total PCBs in sediments but do not specify which congeners were considered. Moreover, OSPAR has not adopted an EAC value for the sum of 7 PCBs in sediments. Therefore, further to experience related to the preparation of the assessments within the 2023 MED QSR, the EAC value of 67,9 is included to present the sum of 7 individual IMAP PCB congeners.

Table 9. Mediterranean EAC values for trace metals in sediments and biota, as endorsed by Decision IG.23/6

Mediterranean EAC values for trace metals in sediments and biota			
TM	**MedEAC***	**#MedEAC**	**#MedEAC**
	Sediments, µg/kg dry wt	***M. galloprovincialis*, µg/kg dry wt**	***Mullus barbatus*, µg/kg wet wt**
	IG.23/6	IG.23/6	IG.23/6
Cd	1200	5000	50
Hg	150	2500&	1000
Pb	46700	7500	300

** Med EAC values equal to ERL (Effects Range Low, Long et al. 1995, idem OSPAR values). # Med EAC values equal to the maximum regulatory levels for contaminants in foodstuffs as provided in EC/EU 1881/2006 and 629/2008 Directives*
& Not included in EU directives, but adopted by OSPAR

[13] Long, E., D. Macdonald, S. Smith and F. Calder (1995). "Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments." Environmental Management **19**(1): 81-97, OSPAR Commission, Agreement number 2009-2. Agreement on CEMP Assessment Criteria for the QSR 2010. Publication number 2009/461.
[14] Table A.3.1:" ERL for ICES sum of 7CB is total CB concentration/2"

Table 10. Mediterranean EAC values for Polycyclic Aromatic Hydrocarbons **(**PAHs) in sediments and biota, as endorsed by Decisions IG.23/6 and IG.22/7, along with a few updated values to ensure consistency with ERL Long et al., and OSPAR EAC values

Mediterranean EAC values for Polycyclic Aromatic Hydrocarbons (PAHs) in sediments and biota				
	Sediments, µg/kg dw		**Biota Mussels, µg/kg dw**	
PAH compounds	**EAC* IG.22/7 and IG.23/6 - OSPAR and ERLs**	**ERL Long et al, 1995[#]**	**EAC** IG.22/7 and IG.23/6 - OSPAR**	**OSPAR[#]**
Naphthalene		160		340
Acenaphthylene		44		
Acenaphthene		16		
Fluorene		19		
Phenanthrene	240		1700	
Anthracene	85		290	
Fluoranthene	600		110	
Pyrene	660		100	
Benzo[a]anthracene	261		80	
Chrysene	384			
Benzo(b)fluoranthene				
Benzo(k)fluoranthene			260	
Benzo[a]pyrene	430		600	
Benzo[g,h,i]perylene	85		110	
Dibenz [a,h]anthracene		63.4		
Indeno[1,2,3-c,d]pyrene	240			
Sum 16 PAHs		4022		

** Med EAC values equal to ERL (Effects Range Low, Long et al. 1995, idem OSPAR values)*
*** Med EAC values equal to OSPAR values*
 # Med EAC values equal to ERL (Effects Range Low, Long et al., 1995) which were not included in Decisions IG.22/7 and IG.23/6.

Table 11. Mediterranean EAC values for for organochlorinated contaminants (PCBs and pesticides) in sediments and biota, as endorsed by Decisions IG.23/6 and IG.22/7 along with the one updated value

Mediterranean EAC values for for organochlorinated contaminants (PCBs and pesticides) in sediments and biota					
	Sediments			**Mussel**	**Fish**
PCBs	**EAC[#] IG.22/7 (µg/kg dry wt) – updated**	**EAC* IG.22/7 (µg/kg dry wt)**	**EAC** IG.23/6 (µg/kg dry wt)**	**EAC** IG.22/7 and IG.23/6 (µg/kg dry wt)**	**EAC** IG.22/7 and IG.23/6 (µg/kg lipid)**
CB28			1.7	3.2	64
CB52			2.7	5.4	108
CB101			3	6	120
CB118			0.6	1.2	24

Mediterranean EAC values for for organochlorinated contaminants (PCBs and pesticides) in sediments and biota					
	Sediments			Mussel	Fish
PCBs	**EAC# IG.22/7 (µg/kg dry wt) – updated**	**EAC* IG.22/7 (µg/kg dry wt)**	**EAC** IG.23/6 (µg/kg dry wt)**	**EAC** IG.22/7 and IG.23/6 (µg/kg dry wt)**	**EAC** IG.22/7 and IG.23/6 (µg/kg lipid)**
CB138			7.9	15.8	316
CB153			40	80	1600
CB180			12	24	480
Sum 7 PCBs	67,9				
Pesticides					
γ-HCH (Lindane)		3		1.45	11 µg/kg ww
DDE(p,p')		2.2		5-50	
Hexachlorobenzene		20			
Dieldrin		2		5-50	

** ERL (Effects Range Low, (Long et al., 1995) or used by OSPAR (2009)*
*** From OSPAR (2009)*
#The EAC value of 11.5 µg/kg dry wt in Decision IG 22/7 originated probably from Long et al, 1995 as explained in document UNEP/MED 427/Inf.3. However, Long et al.,1995 present the ERL value of 22.7 µg/kg dry wt for Total PCBs in sediments but do not specify which congeners were considered. Moreover, OSPAR has not adopted an EAC value for the sum of 7 PCBs in sediments. Therefore, further to experience related to the preparation of the assessments within the 2023 MED QSR, the EAC value of 67,9 is included to present the sum of 7 individual IMAP PCB congeners.

4 The new Environmental Assessment Criteria (EAC) related to IMAP Common Indicator 20

38. The Meeting of CorMon Pollution (27 and 30 May 2022) approved the Mediterranean EAC values for CI 20 which are based on the maximum regulatory levels for certain contaminants in foodstuffs as provided in EC/EU Directives 1881/2006, 1259/2011 and amendments 488/2014 and 1005/2015. The approval of the MedEAC values for CI 20 was provided further to the results of a survey undertaken by the Secretariat – MED POL of the existing sources providing the actual levels of contaminants that have been detected and several contaminants that have exceeded maximum regulatory levels in commonly consumed seafood. Tables 12 to 14 show EAC CI 20 values for TM (Cd, Hg and Pb) and organic contaminants (PCBs, PAHs and dioxin).

39. The MedEAC values for CI 20 are in the low and mid-range of criteria used around the world and have the advantage of being consistent with the regulations of the EU. Their consistent application across the region is necessary. It should also be highlighted that these values were agreed upon at EU level also considering the ecosystem characteristics of the Mediterranean Sea. These values are taxa-specific (fish, mussel, crustacean), as well as species-specific.

Table 12. Mediterranean EACs values for CI 20 related to trace metals as approved by the Meeting of CorMon Pollution (27 and 30 May 2022) based on the maximum regulatory levels for trace metals in foodstuffs for the protection of human health, as provided in EC/EU Directives1881/2006 and its amendments 488/2014 and 1005/2015. The concentrations are presented in mg/kg wet wt.

New EAC CI 20 for trace metals- EU 1881/2006 directive and its amendments 488/2014 and 1005/2015			
	TM, mg/kg wet wt		
matrix	**Cd**	**Hg**	**Pb**
fish muscle	0.05-0.25	0.5-1	0.3
cephalopods	1		1

New EAC CI 20 for trace metals- EU 1881/2006 directive and its amendments 488/2014 and 1005/2015			
	TM, mg/kg wet wt		
matrix	Cd	Hg	Pb
crustaceans	0.5	0.5	0.5
bivalve mollusc	1		1.5

Table 13. Mediterranean EAC values for IMAP CI 20 related to Benzo(a)pyrene and sum of four PAHs as approved by the Meeting of CorMon Pollution (27 and 30 May 2022) based on the maximum regulatory levels for these contaminants in foodstuffs for the protection of human health, as provided in EC/EU EC Regulations 835/2011 and 1259/2011 amending Regulation (EC) 1881/200.6. The concentrations are presented in µg/kg wet wt.

New EACs values for CI 20 related to Benzo(a)pyrene and sum of four PAHs (benzo(a)pyrene, benz(a)anthracene, benzo(b)fluorantheneand chrysene) - EC Regulation (EC) 1881/2006 and amendments 835/2011 and 1259/2011		
Matrix	**Maximum levels (µg kg^{-1} wet wt)**	
	Benzo(a) pyrene	**Sum of Benzo(a) pyrene, Benzo(a) anthracene, Benzo(a) fluoranthene and chrysene**
Smoked fish muscle	2-5	12-30
Smoked bivalve mollusc	6	35
Bivalve mollusk (fresh, chilled or frozen)	5	30

Table 14. Mediterranean EAC values for CI 20 related to Dioxins and PCBs as approved by the Meeting of CorMon Pollution (27 and 30 May 2022) based on the maximum regulatory levels for these contaminants in foodstuffs for the protection of human health, as provided in EC/EU EC Regulation 1259/2011 amending EC Regulation 1881/2006. The concentrations are presented in wet wt.

New EACs values for CI 20 related to Dioxins and PCBs – EC Regulation 1259/2011 amending EC Regulation 1881/2006			
Foodstuffs	**Maximum levels**		
	Sum of dioxins (WHO-PCDD/F-TEQ) (1) pg g^{-1} ww	**Sum of dioxins and dioxin-like PCBS (WHO-PCDD/F-PCB-TEQ) (1) pg g^{-1} ww**	**Sum of PCB28, PCB52, PCB101, PCB138, PCB153 and PCB180 (ICES 6) ng g^{-1} ww**
Fish muscle	3.5	6.5	75
Fish liver	3.5	20	200
Eel muscle	3.5	10	300

(1) Dioxins (sum of polychlorinated dibenzo-para-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), expressed as World Health Organisation (WHO) toxic equivalent using the WHO-toxic equivalency factors (WHO-TEFs)) and sum of dioxins and dioxin-like PCBs (sum of PCDDs, PCDFs and polychlorinated biphenyls (PCBs), expressed as WHO toxic equivalent using the WHO-TEFs). WHO-TEFs for human risk assessment based on the conclusions of the World Health Organization (WHO) (For TEF values see note 31, (EC) Regulation 1259/2011 – Annex 1.1.9.).
Where fish are intended to be eaten whole, the maximum level shall apply to the whole fish.

5 An upgraded approach for updating Environmental Assessment Criteria (EAC) values for IMAP CI 18

40. The BAC and EAC values for IMAP Common Indicator 18 were not updated given the lack of data reported for biomarkers. Therefore, these criteria remain as endorsed in Decisions IG.22/7 and IG.23/6 and are shown here-below in Table 15.

41. The Mediterranean EACs for Biomarkers are based on OSPAR values.

42. Decision IG.23/6 provided the calculation of BAC values, and an update of EAC values, for Stress on Stress (SOS) and Micronuclei Frequency (MN) by using datasets from reference stations submitted by Contracting Parties in 2015.

43. Laboratory results on biomarkers (CI18) are also important for the derivation of the EAC values for CI 17.

Table 15. Mediterranean BACs and EACs for biomarkers in mussel (*M. galloprovincialis*) as endorsed by Decisions IG.22/7 and IG.23/6.

Mediterranean BACs and EACs for biomarkers in mussel (*M. galloprovincialis*)				
Biomarkers/Bioassays and units	BACs IG.23/6 in Mussels (*Mytilus galloprovincilais)*	EACs IG.23/6 in Mussels (*Mytilus galloprovincilais)*	BACs IG.22/7 in Mussels (*Mytilus galloprovincilais)*	EACs IG.22/7 in Mussels (*Mytilus galloprovincilais*)
Lysosomal membrane stability Neutral Red Retention Assay (minutes)			120[a*]	50 [a*]
Lysosomal membrane stability Cytochemical method (minutes)			20 [a*]	10 [a*]
AChE activity (nmol min-1 mg-1 protein) in gills (French Mediterranean waters)			29	20
AChE activity (nmol min^{-1} mg^{-1} protein) in gills (Spanish Mediterranean waters)			15	10
Stress on Stress (days)	11	5		
Metallothioneins (µg/g digestive gland)	247			
Micronuclei frequency (number of cases /1000 cells) in haemocytes)	1			

[a]*Technical annex: assessment criteria for biological effects measurements. Integrated monitoring of chemicals and their effects. ICES Cooperative Research Report No. 315. Davies, I.M. and Vethaak, A.D.Eds.*
**Moore et al., 2006 (Standard values adopted by ICES)*

6 Updated Assessment Criteria for IMAP Ecological Objective 10 (EO10) – Marine Litter

6.1 Updated Assessment Criteria for IMAP EO10 Common Indicator 22

44. The first Baseline Values (BV) for beach macro litter (IMAP CI22) were adopted by COP19 in 2016. [15] Further to the 2016 values, the Secretariat undertook a revision of the BV and proposed the establishment of Threshold Values (TV) for IMAP CI22.

45. For the elaboration and determination of the Baseline and Threshold Values for IMAP Common Indicator 22 (beach macro litter), data were acquired from the following 13 Contracting Parties to the Barcelona Convention for the years 2016 and 2018 (Table 16).

Table 16: Number of surveys by country (beach litter)

Sub-regions	Country	Surveys	Years
WM	Algeria	111	2018
	France	88	2016, 2017, 2018
	Italy	162	2016, 2017, 2018
	Malta	24	2017, 2018
	Morocco	16	2018
	Spain	139	2016, 2017, 2018
CM	Greece	3	2018
	Italy	66	2016, 2017, 2018
	Libya	12	2018
ADR	Italy	132	2016, 2017, 2018
	Slovenia	16	2017
	Montenegro	4	2018
	Albania	4	2018
	Croatia	6	2017, 2018
EM	Cyprus	31	2016, 2018
	Israel	8	2017, 2018

46. The BV for IMAP CI22 was based on the calculation of the median values for the Mediterranean sub-regions, whereas the TV for IMAP CI22 was calculated based on the 15th percentile (Q15) of the BV. The respective BV and TV that were approved by COP22 (Decision IG.25/9[16]) for IMAP CI22 are reflected in Table 17 hereunder:

Table 17: 2016 (Agreed) and 2019 (Proposed/Updated) Baseline Values; Proposed Threshold Values; and percentage reduction in baseline values to achieve GES.

IMAP Indicators	Categories of Marine Litter	BV-2016	Proposed BV-2021	Proposed TV-2021
CI22	Beach Marine Litter	450-1400 items/100m	**369 items/100m**	**130 items/100m**

[15] Decision IG.22/10 - Implementing the Marine Litter Regional Plan in the Mediterranean (Fishing for Litter Guidelines, Assessment Report, Baselines Values, and Reduction Targets).
[16] Decision IG.25/9 - Amendments to the Regional Plan on Marine Litter Management in the Mediterranean in the Framework of Article 15 of the Land Based Sources Protocol.

47. The said assessment criteria comprising of the baseline and threshold values for IMAP Common Indicator 22 are used for the needs of the present 2023 MED QSR.

6.2 Updated Assessment Criteria for IMAP EO10 Common Indicator 23

48. The first Baseline Values (BV) for seafloor macrolitter and floating microplastics (IMAP CI23) were adopted by COP19 in 2016. [17] Further to the 2016 values, the Secretariat is undertaking a revision of the BV and proposes the establishment of Threshold Values (TV) for IMAP CI23 (i.e., seafloor macrolitter and floating microplastics).

49. For the elaboration and determination of the Baseline and Threshold Values for IMAP Common Indicator 23 (seafloor macrolitter and floating microplastics), the data used correspond to data collected from 15 Contracting Parties to the Barcelona Convention between 2016 and 2022 in the framework of the respective IMAP-based national monitoring programmes, and officially submitted and validated through the IMAP InfoSystem.

50. For seafloor macrolitter, eleven (11) countries have contributed with data (Table 18). The data were submitted by the respective Focal Points through an official submission through IMAP InfoSystem, and have undergone thorough quality checks, and thus do not contain erroneous data.

Table 18: Number of surveys per respective Contracting Party used for the elaboration of updated BV and proposal of TV for seafloor macrolitter (IMAP CI23)

Country	Number of Trawl Surveys	Years
Croatia	27	2017, 2018, 2019, 2020
Cyprus	130	2016, 2017, 2018, 2019, 2020
France	332	2016, 2017, 2018, 2019, 2020, 2021
Israel	11	2020, 2021, 2022
Malta	48	2016, 2017
Montenegro	5	2019, 2020
Morocco	15	2018, 2019, 2022
Slovenia	32	2017, 2018, 2019, 2020
Spain	639	2016, 2017, 2018, 2019, 2021, 2022
Tunisia	10	2018, 2020
Turkey	55	2016, 2019
TOTAL	**1,320**	

51. For floating microplastics, eleven (11) countries have contributed with data (Table 19). The data were submitted by the respective Focal Points through an official submission through IMAP InfoSystem and have undergone thorough quality checks.

[17] Decision IG.22/10 - Implementing the Marine Litter Regional Plan in the Mediterranean (Fishing for Litter Guidelines, Assessment Report, Baselines Values, and Reduction Targets).

Table 19: Number of surveys per respective Contracting Party used for the elaboration of updated BV and proposal of TV for floating microplastics (IMAP CI23)

Country	Number of Surveys	Years
Bosnia and Herzegovina	3	2019, 2021
Croatia	30	2017, 2018, 2019, 2020
France	52	2017, 2018, 2020, 2021
Greece	26	2017, 2019, 2020
Israel	21	2019, 2020, 2021
Italy	1,839	2016, 2017, 2018, 2019, 2020
Lebanon	14	2019
Slovenia	32	2019, 2020
Spain	426	2017, 2018, 2019, 2020, 2021, 2022
Tunisia	6	2017, 2019, 2020
Turkey	25	2016, 2017, 2018, 2019, 2020
TOTAL	**2,474**	

52. The BV for IMAP CI23 (i.e., seafloor macrolitter and floating microplastics) was based on the calculation of the median values for the Mediterranean sub-regions. The TV for floating microplastics was calculated based on the 15th percentile (Q15) of the BV, whereas for the seafloor macrolitter the proposed baseline values also serves as threshold value based on the application of the "non-deterioration" approach.

53. The respective BV and TV were reviewed by Meeting of the Ecosystem Approach Correspondence Group on Marine Litter Monitoring (CORMON Marine Litter, Athens, Greece, 3 March 2023) and an updated version has been prepared for the upcoming Integrated CORMON Meeting (Athens, Greece, 27-28 June 2023). The updated values are presented under Table 20 hereunder:

Table 20: 2016 (Agreed) and 2022 (Proposed/Updated) Baseline Values and Threshold Values for IMAP CI23, seafloor macrolitter and floating microplastic.

IMAP Indicators	Categories of Marine Litter	BV-2016	Updated BV-2023	Proposed TV-2023
CI23	Seafloor Macro-litter	130-230 items/km^2	135 items/km^2	135 items/km^2
CI23	Floating Microplastics	200,000–500,000 items/km^2	0.044338 items/m^2	0.000845 items/m^2

Annex I
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