



UNITED
NATIONS

EP

UNEP/MED WG.627/12



**Mediterranean
Action Plan**
Barcelona
Convention

15 august 2025
Original: English

Meeting of the MED POL Focal Points

Athens, Greece, 17 – 19 June 2025

Meeting Report

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UNEP/MAP
Athens, 2025

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Introduction

1. In accordance with the United Nations Environment Programme/Mediterranean Action Plan (UNEP/MAP), Programme of Work 2024-2025 adopted by the 23rd Ordinary Meeting of the Contracting Parties to the Barcelona Convention and its Protocols (Portoroz, Slovenia, 5-8 December 2023), the UNEP/MAP Secretariat (MED POL Programme) organized a three day “Meeting of MED POL Focal Points”, on 17 -19 June 2025, in Athens, Greece.

2. The main objectives of the Meeting were to:

- Review the progress made in implementing the activities executed by MED POL during 2024-2025 biennium and the proposed activities for the 2026-2027 biennium.
- Present the changes introduced to the reporting format of the Barcelona Convention Reporting System (BCRS) for the implementation of the Land-Based Sources Protocol.
- Review and endorse the proposed enhancement of the EcAp Roadmap and IMAP with regard to pollution (EOs 5, 9), marine litter (EO 10) and noise (EO 11).
- Address a number of emerging issues resulting from recent and global regulatory and policy developments relevant to UNEP/MAP in the field of pollution prevention and control.
- Present the draft National Action Plans / Programmes of Measures (NAPs/PoMs) by all Contracting Parties.

Participation

3. The meeting was attended by representatives of the following Contracting Parties (Albania, Bosnia and Herzegovina, Cyprus, European Commission, Egypt, France, Greece, Lebanon, Malta, Montenegro, Morocco, Spain, State of Libya, Tunisia, and Türkiye).

4. The United Nations Environment Programme (UNEP), including the Secretariat of the Barcelona Convention was represented by the Programme for the Assessment and Control of Marine Pollution in the Mediterranean (MED POL).

5. The full list of participants is attached as Annex I to the present report.

Agenda Item 1: Opening of the meeting

6. The Meeting was opened at 9:30 AM on Tuesday, June 17, 2025, by the MAP Coordinator of the UNEP/MAP Barcelona Convention, Ms. Tatjana Hema.

7. The Coordinator welcomed participants to the MED POL Focal Points Meeting and emphasized its importance as a key formal event within the MAP biennial cycle. She noted that the meeting provides an essential platform to assess progress, review key documents, and align efforts under the MAP Programme of Work.

8. The Coordinator highlighted the strategic value of holding this year’s meeting in conjunction with discussions on the National Action Plans (NAPs), positioning it within the broader roadmap leading up to COP 24 in December 2024.

9. The Coordinator referred to the ongoing revision of the Mediterranean Strategy for Sustainable Development (MSSD), describing it as a strengthened and forward-looking document, enriched by inputs from Contracting Parties and civil society through the MCSDD. She underscored the enhanced focus on pollution control, the circular economy, and the achievement of Good Environmental Status (GES) and urged participants to support the inclusion of NAP implementation as a flagship initiative within the revised strategy, highlighting its direct contribution to Objective 1 on the sustainable use of marine and coastal resources.

10. The Coordinator also reported on progress in updating the Ecosystem Approach (EcAp) Roadmap, noting that while revisions are modest, they reflect key developments since its original adoption in 2008. This work was closely tied to the ongoing revision of the Integrated Monitoring and Assessment Programme (IMAP), particularly in the area of pollution monitoring.

11. Regarding MED POL activities under the MAP Programme of Work 2026–2027, the Coordinator highlighted that they were based on a gap analysis comparing the objectives of the mid-term strategy with current progress. She acknowledged existing financial limitations, noting that although the activity planning was ambitious, budget constraints may affect implementation. Therefore, she called on focal points to critically assess the relevance and completeness of the proposed activities and to put forward any final recommendations, as this would be the last opportunity before finalization.

12. In closing, the Coordinator reiterated the importance of finalizing the NAPs. Referring to discussions held in Loutraki, she confirmed the Secretariat's intention to bring a decision to COP 24 endorsing the NAPs and calling for their implementation, with the support of Contracting Parties, donors, and other partners.

Agenda Item 2: Organizational matters

a) Rules of Procedure for the Meeting

13. The Rules of Procedure for Meetings and Conferences of the Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean and its Protocols were applied mutatis mutandis to the present Meeting (UNEP/IG.43/6, Annex XI).

b) Election of Officer

14. Subject to Rule 20 of the rules of procedure mentioned in para. 2(a) for meetings and conferences of the Contracting Parties, the Meeting elected one (1) Chair, two (2) Vice Chairs, and one (1) Rapporteur from among the participants, as follows:

Chair:	Ms. Annabelle Hamer, Malta
First Vice Chair:	Mr. Mohammed EL Bouch, Morocco
Second Vice Chair:	Ms. Ms. Kalliopi Pagkou, Greece
Rapporteur:	Ms. Ivana Mitrovic, Montenegro

c) Adoption of the Provisional Agenda

15. Subject to Rule 14 of the Rules of Procedure mentioned in para. 2(a), the proposed agenda appearing in document UNEP/MED WG.627/1 and annotated in document UNEP/MED WG.627/2/Rev.1 were reviewed and accepted. The Annotated Agenda was adopted by the Meeting as appended in Annex II to the present document.

d) Organization of Work

16. The discussions were held in two plenary sessions, from 9:30 to 12:30 and from 14:30 to 17:30.

17. Simultaneous interpretation in English and French was available for all sessions.

18. The Meeting addressed all agenda items during the three-day meeting. The Meeting closed on 19 June 2025 at 17:30 pm after the adoption of the Conclusions and Recommendations as appended in Annex III to this present document.

Agenda Item 3: Updated National Action Plans / Programmes of Measures 2025-2035

19. Under this agenda item, the representatives of Contracting Parties to the Barcelona Convention were invited, by alphabetical order, to present their respective draft National Action Plans/Programmes of Measures (NAPs/PoMs).

20. The representative of Albania, Ms. Elvana Ramaj, presented the three national strategies developed following the adoption of the 2015 NAP, along with the gaps identified in the implementation of its measures. She also outlined the legally binding commitments stemming from the six newly adopted regional plans, reflecting updates in Albania's legal framework. Furthermore, Ms. Ramaj highlighted ten identified pollution hotspots located mainly in coastal areas and described the national measures addressing Ecological Objectives EO5, EO9, and EO10. She concluded by emphasizing the main challenges faced by Albania, particularly in financial, institutional, and technical areas.

21. The representative of Bosnia and Herzegovina, Ms. Selma Čengić, presented the current status of the country regarding improvements in regulatory, planning, and strategic aspects of water and environmental management. She highlighted the gaps identified in the implementation of the measures from the previous NAP (2015), as well as those derived from the six newly adopted regional plans under the framework of the LBS Protocol. She also presented the two identified hotspots in the country, along with the list of national measures under each of the Ecological Objectives (EO5, EO9, and EO10). Finally, Ms. Čengić highlighted the challenges Bosnia and Herzegovina is facing in the preparation of the new NAP, particularly those related to legal, institutional, and human resource capacities.

22. The representative of Cyprus, Mr. Konstantinos Antoniadis, presented the country's current status concerning the assessment of hotspots and sensitive areas conducted in 2025. He noted that a previously identified hotspot is no longer classified as such, although continuous monitoring of the area will be maintained. He also outlined the existing gaps and corresponding measures related to Ecological Objectives (EOs) 5, 9, and 10, noting that the assessment of Cyprus's marine waters under EO5 and EO9 indicated Good Environmental Status. Additionally, he presented the main challenges faced, particularly in the areas of human resources, control and enforcement, and coordination.

23. The representative of France, Ms. Alexane Lovat, explained that France has chosen to base the update of its National Action Plan (2025–2035) on programmes of measures developed at the national level and/or within the framework of European Union legislation, aimed at addressing land-based pollution in the Mediterranean. In this context, she referred to key planning documents, including the Strategic Façade Document (DSF) and the Water Development and Management Master Plans (SDAGE). She also highlighted the legal texts underpinning the measures adopted in France, particularly those addressing the regional plans adopted under the LBS Protocol. Additionally, she presented examples of measures under the Mediterranean Marine Strategy Framework Directive (MSFD) related to Ecological Objectives (EOs) 5, 9, and 10.

24. The representative of Greece, Ms. Kalliopi Pagkou, presented the reporting status of Greece under the MSFD and highlighted that the second update of the Greek Programme of Measures (GR-PoMs) will be initiated in 2025 and completed by 2027. She shared the list of existing and new measures under Descriptors 5, 9, 10, and 11, which correspond to Eutrophication, Contaminants, Marine Litter, and Underwater Noise, respectively. She also outlined the challenges faced in the implementation of the MSFD.

25. On behalf of Israel, the Secretariat – MED POL presented the progress made in Israel in reducing major pollutants and decreasing the number of hotspots identified in the 2015 NAP, noting that only one hotspot remains and is considered for the new NAP. The presentation also provided an update on the national status concerning the implementation of the newly adopted Regional Plans under the framework of the LBS Protocol. Key national challenges were also outlined, including limited inter-ministerial coordination, insufficient funding, the high costs associated with expanding inland monitoring, and political barriers to enforcing a ban on single-use plastics.

26. On behalf of Italy, the Secretariat – MED POL presented the status of measures in Italy, in particular the status of urban wastewater collection and treatment across Italian territory, measures related to urban stormwater management, relevant EU policies and indicators for agricultural management, and key measures pertaining to aquaculture management. The presentation also covered the new measures identified by the country for the implementation of the MSFD.

27. The representative of Lebanon, Ms. Celine Mahfouz, presented the status of implementation of the previous National Action Plan (NAP 2015) and the obstacles encountered in its implementation. For the update of NAP, she provided the list of the hotspots identified at the national level, along with the measures outlined under Ecological Objectives (EOs) 5, 9, and 10, and the corresponding implementation timeline. Additionally, she highlighted the challenges faced in updating the NAP.

28. The representative of Libya, Mr. Ahmed Abugdera, presented the draft National Action Plan (NAP), highlighting that Libya has not previously prepared a NAP report. He shared key findings related to Ecological Objectives EO5, EO9, and EO10, based on national assessments. He also presented a list of identified hotspots, acknowledging that it was developed using limited available data. Furthermore, he outlined the proposed measures addressing the three pollution- and marine litter-related Ecological Objectives along with the implementation timeframe. Mr. Abugdera also highlighted the main challenges encountered in developing the NAP, particularly those concerning institutional, legal and policy frameworks, as well as technical and financial constraints.

29. The representative of Malta, Mrs. Annabelle Haber, emphasized that the country's Programme of Measures is designed to achieve Good Environmental Status. She noted that Malta's measures, developed under the EU Water Framework Directive (WFD) and Marine Strategy Framework Directive (MSFD), are aligned with and build upon the regional measures, including those adopted under the Barcelona Convention. Mrs. Haber presented national measures addressing pollution and marine litter-related Ecological Objectives, as well as relevant cross-cutting actions. She also highlighted key challenges faced in Malta, including limited resources, coordination among institutions, and the need for regular updates and follow-up.

30. The representative of Montenegro, Ms. Marina Markovic, presented the process followed and the key plans and strategies considered for updating the NAP. She also presented the finding of gap analysis performed in terms of implementation of NAP 2015 and the new six adopted regional plans. She highlighted the hotspots identified and presented the NAP 2025-2035 implementation plan including the national measures for EOs 5, 9 and 10, including respective timelines and indicators. She also highlighted key implementation challenges regarding capacity constraints (financial, human), plans vs. actual implementation, and competing priorities.

31. The representative of Morocco, Mr. Mohamad El Bouch, presented the key steps taken in updating the NAP, the scope of the report, and the evaluation of progress in implementing the previous NAP. He also presented the measures and projects from the previous NAP that were not implemented, the evaluation and identification of hotspots, the selection and prioritization of measures for the updated NAP, the associated Implementation Plan and monitoring indicators, as well as the priority projects.

32. On behalf of Palestine, the Secretariat – MED POL presented the progress made in preparing the 2025–2035 NAP, highlighting the list of hotspots, the identified gaps related to pollution and Marine Litter Operational Objectives, and the proposed measures. The presentation also addressed the challenges faced in Palestine, particularly those of a political, institutional, technical, and financial nature.

33. On behalf of Spain, the Secretariat – MED POL presented a comparison between the NAP development process and marine strategies, along with the three cycles for the preparation of Programmes of Measures (PoMs) for 2012–2018, 2018–2024, and 2024–2027. It was noted that the second cycle corresponds to the NAPs for 2015–2025 and 2025–2035. The presentation highlighted the hotspots identified under Ecological Objectives (EOs) 5, 9, and 10, as well as the measures implemented to eliminate these hotspots and fulfill national and regional obligations, including those under the regional plans adopted within the framework of the Barcelona Convention. Additionally, it outlined the challenges faced and lessons learned during the preparation and implementation of the PoMs.

34. The representative of Tunisia, Mr. Yassine Marzougui, provided an overview of the methodology and timeline to be followed for the preparation of the updated National Action Plan (NAP). He detailed the current status of progress in addressing the pollution hotspots that were identified in the 2015 NAP, outlining the efforts made to mitigate their impact. Mr. Marzougui also presented the implementation status of the measures included in the 2015 NAP and in the new adopted regional plans, highlighting both completed actions and those still in progress.

35. The representative of Türkiye, Mr. Mehmet Tamer Çobanoğlu, presented the methodology and key steps undertaken to update the 2015 National Action Plan (NAP). This included a series of stakeholder's meetings and thematic workshops aimed at assessing the status, conducting a gap analysis, defining applicable targets, prioritizing potential measures, and updating information on pollution hotspots and vulnerable areas. He emphasized the various related projects and programs that supported the assessment process. Additionally, Mr. Çobanoğlu presented the operational targets, the outcomes of the gap analysis, and the proposed potential measures, with a particular focus on addressing pollution from urban, industrial, and agricultural sectors.

36. Several Contracting Parties raised questions regarding the use of socioeconomic analysis for the prioritization of measures, specifically whether the cost-benefit analysis tool presented by PB/RAC during the Loutraki meeting is mandatory or optional. In response, the Coordinator clarified that the methodology presented is based on Annex C of the NAP Guidelines and represents a simplified, more targeted approach. She emphasized that the purpose was to assist CPs in conducting practical socioeconomic assessments, particularly in situations where data availability was limited. She further explained that countries are free to use alternative methodologies if these are more appropriate or already in use, noting that the overall objective is to ensure a sound and evidence-based process for the selection of priority measures.

37. One Contracting Party raised a question regarding the comparability of identified pollution hotspots among countries, particularly in relation to their associated levels of risk and pollution impact. In response, the Coordinator explained that the updated hotspot identification methodology emphasizes the use of quantifiable data, with each country responsible for applying the methodology to determine its own hotspots. It was further clarified that the methodology was not intended to support cross-country comparisons of hotspot, as the criteria applies to national data. While countries may report a similar number of hotspots or assign them to the same risk category (e.g., Category A), this does not imply equivalence in scale or impact. The agreed categorization is intended to be applied within each national context.

38. At the end of this agenda item, the Meeting acknowledged and appreciated the progress made by the Contracting Parties in the preparation/update of their National Action Plans (NAPs), particularly in developing the Programmes of Measures. It emphasized the importance of this process and urged the Contracting Parties to finalize their NAPs. Additionally, it called on Contracting Parties that are also EU Member States to submit their Programmes of Measures instead of the NAP as appropriate prior to the MAP Focal Points meeting (16-19 September 2025).

Agenda Item 4: Status of implementation of MED POL activities during 2024-2025 biennium, including related Projects (MedProgramme, ML MED PLUS Project, and EcAp MED PLUS Project)

39. Under this agenda item, Ms. Jelena Knežević, Monitoring and Assessment Officer, and Mr. Erol Cavus, Pollution Officer at UNEP/MAP – MED POL, presented document UNEP/MED WG.627/3, titled “*Progress Achieved in the Implementation of the 2024–2025 Programme of Work, Including the MedProgramme and Other Projects (ML MED PLUS and EcAp MED PLUS Projects)*”, summarizing the progress made on the implementation of the main activities carried out by MED POL, in accordance with the Programme of Work 2024-2025 and the MAP Mid-Term Strategy (2022-2027) Programme 1 “Pollution and Litter Free Mediterranean Programme”, Programme 5 “Governance”, and Programme 6 “Shared Vision of the Mediterranean Programme”.

40. The Secretariat – MED POL presented the main achievements under the 2024-2025 PoW and budget, with a particular focus on the development of the lists of potential measures by Contracting Parties for integration into the consolidated National Action Plans/Programmes of Measures; the proposed revisions of EcAp and IMAP related to Pollution and Marine Litter, as mandated by Decision IG.26/3; including update of Operational Objectives, Good Environmental Status (GES) definitions, and Targets, as well as revision of IMAP Common Indicators related Ecological Objectives 5, 9, and 11; the proposal for the development of new IMAP EO10 Common Indicators 22 and 23; and the proposal to establish Threshold Values for IMAP Common Indicator 24.

41. The Secretariat – MED POL also presented its contribution to pilot actions to prevent, eliminate and dispose of obsolete chemicals under Child Project 1.1 of the GEF-funded MedProgramme, the implementation of EU-funded Marine Litter MED PLUS Project, as well as support to implementation of ongoing EU-funded EcAp MED PLUS Project.

42. One Contracting Party expressed that for the upcoming cycle, the Contracting Parties (CPs) should be given the opportunity to update the GES (Good Environmental Status) assessment methodologies, even if these have been previously approved and applied. This should also include key assessment elements—for example, for nutrients—allowing Parties to contribute data they have and the threshold values they use. This approach would help ensure that national assessments are not limited or rendered incompatible with regional assessments. In the case of Spain, for instance, instead of Total Phosphorus, the focus is on Dissolved Phosphorus, which is used by phytoplankton and is also reported under the MSFD. Spain also confirmed the participation of its representative in the OWG on Eutrophication upon its establishment.

43. Another Contracting Party highlighted the need to build capacity for sampling and analysis in the monitoring of Common Indicators 13, 14, and 17, pointing out, for example, the lack of laboratory capacity to apply methods for Chlorophyll a other than the classical one. Regarding microplastics, he provided information on national efforts to integrate microplastics into national monitoring activities. In this regard, he requested support for organizing proficiency testing on microplastics, which will strengthen national capacities through inter-comparison exercises and the exchange of experiences. He also emphasized the need to ensure integration of indicator-based monitoring—specifically referring to the possible integration of Common Indicators 24 (EO10) and 1 (EO1), both having marine turtles in the frontline.

44. One Contracting Party congratulated MED POL on the progress achieved and extended congratulations on the occasion of MAP’s 50th anniversary. Regarding microplastics (and microliter),

he noted that within the EU, a substantial volume of data has been collected—stemming from more than 2,800 surveys. However, he acknowledged the challenges related to data quality. To address this, a new initiative has been launched to refine requirements that will improve data quality, including the use of appropriate reference materials in proficiency testing. It was proposed to establish strong link with the expected intercalibration exercise planned under UNEP/MAP (pending approval of the 2026-2027 Programme of Work). He thanked MED POL for its participation in TGML and extended an invitation to individual countries to cooperate in establishing optimal control over microplastic/microliter data.

45. **Another Contracting Party** highlighted the importance of ensuring coherence between national and regional assessments, particularly in relation to assessment methodologies established under the MSFD and national regulations.

46. In its response, the Secretariat – MED POL recalled the discussion during the Meeting of the Joint CorMons, emphasizing that the work on assessment criteria is ongoing and progresses depending on the quantity and quality of the data reported. It was further noted that national, sub-regional, and regional values are expected to differ. However, setting sub-regional BAC values allows for a more accurate reflection of ecosystem characteristics. As outlined in the introduction, the development of EACs still needs to be initiated, as even the current regional values do not adequately reflect the ecotoxicological status in the Mediterranean. The Secretariat reiterated the invitation to countries to actively participate in the OWGs once established, as ecotoxicity data must be sourced from the scientific literature, given that such data are not subject to mandatory reporting under the IMAP Info System. In response to the query on capacity building for monitoring Common Indicators 13, 14, and 17, The Secretariat – MED POL – recalled the expanded scope of collaboration with IAEA-MESL during the current biennium and expressed its expectation that this will help address existing knowledge gaps. This now includes proficiency testing and training courses related to contaminants in seafood, chlorophyll-a, and nutrients in both low- and high-salinity waters, in addition to existing activities on contaminants in sediments and biota relevant to Common Indicator 17.

47. The Meeting's final conclusions related to this agenda item are presented in Annex III of this report.

Agenda Item 5: a) Enhanced EcAp Policy and its implementation (GES, Targets, Governance)

48. The Secretariat – MED POL presented Working document UNEP/MED WG.627/4/Rev.1 titled “Enhanced EcAp Policy and its Implementation” She explained that, in line with Decision IG.26/14 (COP 23, 2023) and the mandate on the EcAp Roadmap and IMAP revision, the Secretariat - MED POL prepared a draft to update Operational Objectives, IMAP Common Indicators, GES definitions, and Targets for EO 5 (Eutrophication) and EO 9 (Pollution). The proposal was first presented at the CorMon Pollution online meeting on 30 January 2025, where the establishment of an Online Working Group was agreed. Following a careful review of the agreed document by the Online Working Group, the Secretariat identified minor adjustments needed to align fully with relevant decisions, especially regarding certain GES targets.

49. After the introductory remarks, she presented the proposed revisions to the targets for IMAP Common Indicators 13 and 14 (EO 5 – Eutrophication), IMAP Common Indicators 17, 18, 20, and 21 (EO 9 – Contaminants), and IMAP Candidate Common Indicators 26 and 27 (EO 11 – Underwater Noise), as reviewed and agreed by the Joint Meeting of the Ecosystem Approach Correspondence Groups on Pollution and Marine Litter Monitoring (Anavyssos, Greece, 27 -28 May 2025).

Emphasis was given on the key achievements from 2019–2023, setting the ground for the revised targets in order to ensure their alignment with GES/non-GES classifications used in the 2023 Mediterranean Quality Status Report (2023 MED QSR). She informed that the Joint Meeting did not

support the proposed upgrading of Candidate Common Indicators 26 and 27 to IMAP Common Indicators, reflecting major progress in underwater noise assessment.

50. Mr. Christos Ioakeimidis, QSR Programme Management Officer at UNEP/MAP, proceeded to introduce the updated version for IMAP Ecological Objective 10 (Marine Litter). He provided detailed explanation on the proposed revisions under IMAP EO10, including the new indicator on riverine litter and the upgrade of Candidate Indicator 24 to Common Indicator, both reviewed and agreed by the CORMON Marine Meeting in January 2025 and the Joint CORMON Meeting in May 2025. Detailed information was provided with regards to the updates/revisions introduced during the Joint CORMON Meeting on the Indicator definition, GES definition and target for Common Indicator 24, along with minor edits on the GES definition and target for the new Common Indicator 28.

51. One Contracting Party explained that the current candidate status of indicators 26 and 27 reflects their transitional nature, adding that detailed technical comments had been presently submitted to the Secretariat in writing. She also referred to the issue of the Joint Meeting not being organized in a hybrid format, which would have enabled broader participation by national experts.

52. The Secretariat – MED POL provided a procedural explanation, noting that all proposals must be shared with the Meeting and are subject for consideration by its participants. It was further clarified that the Joint Meeting was mandated to be held in person only. The responsibility for reviewing substantive—technically and scientifically based—issues lie with the Correspondence Groups on Monitoring (CorMons), while the present meeting may consider the outcomes of CorMon’s work in terms of implications for programming and governance. Any technical errors identified should be brought to the attention of the current meeting; however, this should not involve questioning substantive aspects already discussed and agreed upon by national experts within the CorMon’s mandate.

53. Following this explanation, one Contracting Party requested clarification on the thresholds applied and proposed amending the target for the Candidate Common Indicator 26 by adding the phrase “for a limited amount of time”, in light of ongoing work under the TG Noise group of the MSFD. Another participant emphasized the importance of regular participation of UNEP/MAP – MED POL representatives in the EU-MSFD TG Noise meetings.

54. The proposal to amend the target of the Candidate Common Indicator 26 was agreed upon by the Meeting, following additional consultations conducted by one representative with his national expert team. Following this amendment, Working document UNEP/MED WG.627/4/Rev.1, as reflected in Appendix 1 and Appendix 2 of the Conclusions and Recommendations, was endorsed for submission to the 12th Meeting of the Ecosystem Approach Coordination Group (EcAp CG) (15 Sept. 2025).

55. The Secretariat presented the “Terms of Reference and Flow of Interaction for the Correspondence Groups on Monitoring and Online Working Groups”, with an emphasis on the sections relevant to the CORMONs and Focal Points mandate, as reflected in Working Document UNEP/MED WG.627/4/Rev.1.

56. A number of representatives of Contracting Parties took the floor, welcomed and endorsed the possible products and proposed interaction between EcAp governing bodies, in particular for aspects relevant to the CORMONs and Focal Points.

57. The Meeting endorsed the submission of Terms of Reference and Flow of Interaction to the 12th Meeting Ecosystem Approach Coordination Group (EcAp CG) (15 Sept. 2025) for further integration in the draft Decision on EcAp matters, to be subsequently submitted to the Meeting of the MAP Focal Points (16-19 Sept. 2025) and COP 24 (2-5 Dec. 2025).

Agenda Item 5: b) Enhanced Integrated Monitoring and Assessment Programme (IMAP) (Pollution and Marine Litter cluster, Common Indicators updated fact sheets, assessment criteria/thresholds)

58. The Secretariat proceeded by introducing Working document UNEP/MED WG.627/5/Rev.1 titled “Revised IMAP: Pollution, Litter and Noise Clusters”, explaining that it updates the *Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria (IMAP)*, originally adopted by Decision IG.22/7 of COP 19. The updates reflect developments within the UNEP/MAP Barcelona Convention framework since 2016 and focus on the Pollution and Litter components—Ecological Objectives (EO) 5, 9, 10, and 11. An initial revision effort appeared in Document UNEP/MED WG.595/Inf.4, prepared for the 11th Meeting of the Ecosystem Approach Coordination Group (EcAp CG), held online on 2 October 2024. The current updates incorporate decisions made by the Contracting Parties (via EcAp CG, MAP, and COP) on methodologies and assessment criteria, which were applied during the preparation of the 2023 Mediterranean Quality Status Report (2023 MED QSR).

59. Referring to the on-screen document (UNEP/MED WG.627/5/Rev/1), the Secretariat – MED POL presented the IMAP updates for EO 5, 9, 10 and 11, including the relevant assessment criteria as reflected in Appendix III of this document, as reviewed and agreed by the Joint Meeting of the Ecosystem Approach Correspondence Groups on Pollution and Marine Litter Monitoring, highlighting also their alignment with revised targets for eutrophication, contaminants, marine litter and noise, as outlined in Working Document UNEP/MED WG.627/4/Rev.1.

60. One Contracting Party informed the Meeting about the ongoing evaluation of the applicability of previously adopted reference and boundary values for Ecological Objective 5, particularly in relation to Chlorophyll a in Type III-E. She explained that the intercalibration process under the EU Water Framework Directive may lead to discrepancies between national and IMAP threshold values. Regarding the new Common Indicator 28, she emphasized the need to account for differences in riverine sources across Contracting Parties, particularly when applying methodologies for determining marine litter inputs from rivers. She noted that her country’s water courses consist mainly of small streams. In response, the Secretariat noted that the region-wide guidelines take into consideration the region’s differences varying from steady river flows to seasons current and flows.

61. On the qualitative assessment, it was stressed that it should be accompanied by a quantitative assessment to ensure a realistic understanding on the level of pressures. In this context, she questioned whether the assessment of marine litter ingestion should be expanded to include a more detailed evaluation of species' health, and whether threshold values should reflect even minimal impacts on turtles.

62. Representatives from Contracting Parties took the floor and stressed the importance of establishing threshold values for Common Indicator 24, for ingestion and entanglement, as well as to agree and establish a methodology, while noting that data for entanglement require for additional support and enhanced data management. Concern was also raised with regard to the data deriving from by-catch, referring to difficulty in linking fishing activity. In response, the Secretariat confirmed that by-catch was taken into consideration while elaborating the proposed TV for Common Indicator 24.

63. In response, the Secretariat invited national representatives to actively participate in the Online Working Group on Eutrophication once it commences, thereby contributing to the further alignment of regional and national threshold values.

64. Further to the consent of the Joint Meeting of the Correspondence Groups on Pollution and Marine Litter Monitoring (CorMons) regarding the potential elevation of Candidate Indicators 26 and 27 on noise to Common Indicator status, the Coordinator invited the Meeting to reconsider their inclusion in the regular monitoring framework, highlighting that after eight years of maintaining these indicators in candidate status—despite the inherent challenges associated with noise monitoring—it is

important to ensure balanced efforts are undertaken across the region in this domain. While there is expressed support from the MED POL Focal Points, their endorsement does not precede the decision-making role of the MAP Focal Points.

65. In support of the Coordinator's proposal, one Contracting Party noted that substantial region-based information is available, including continuous ship traffic noise modelling. Another Contracting Party supported the transition from candidate to common status, citing significant progress made over the past few years. Echoing this view, a third Contracting Party acknowledged that while challenges remain—particularly in terms of methodologies for monitoring and assessment—the inclusion of noise indicators is justified. Another Contracting Party, supported by two others, advocated for the integration of noise indicators into national monitoring programmes while continuing to strengthen national capacities.

66. However, one Contracting Party questioned how the status of these indicators could be changed without establishing mandatory monitoring obligations. Another Contracting Party emphasized that the decision on noise indicators should rest with the MAP Focal Points. This view included a recommendation to continue engagement with ACCOBAMS for technical support to countries. A third Contracting Party supported this position, noting that underwater noise monitoring could overlap with certain national security concerns, and thus more time is required before assigning mandatory status to these indicators.

67. The Coordinator further clarified that retaining these indicators in candidate status may not send the right message regarding regional commitment. To address the varying views expressed by countries, the Coordinator reiterated that meaningful progress cannot be achieved if noise indicators remain outside national monitoring programmes. However, there is no expectation for immediate implementation at the national level, especially in light of broader issues that extend beyond the environmental scope. Without their inclusion in regular monitoring programmes, it is difficult for the Secretariat to mobilize or outsource technical assistance in support of national efforts. The revised IMAP will be approved by COP decision, which may highlight the need for dedicated financial and technical support for implementing noise monitoring.

68. In light of existing constraints, and the need for further national consultations, the Coordinator proposed that the Meeting defer a final decision at this stage and invite the EcAp Coordination Group to determine whether Candidate Indicators 26 and 27 can be upgraded to Common Indicators at its 12th Meeting, scheduled for 15 September 2025.

69. Following the amendment of paragraph 38 and the Meeting's decision to defer the final decision on noise monitoring to the Ecosystem Approach Coordination Group, the Working Document UNEP/MED WG.627/5/Rev.1 — as reflected in Appendix III of the Conclusions and Recommendations — was endorsed for submission to the 12th Meeting of the Ecosystem Approach Coordination Group (EcAp CG), scheduled for 15 September 2025.

70. The Secretariat – MED POL presented Working Document UNEP/MED WG.627/7/Rev.1 on the updated Guidance Factsheets for IMAP Common Indicators 13, 14, 17, 18, 20, and 21. She recalled that, in alignment with IMAP, initial Guidance Factsheets for Pollution Common Indicators were developed, reviewed, and endorsed in 2016 and 2017, following Decisions IG.22/7 (COP 19, 2016) and IG.23/6 (COP 20, 2017). In 2019, these Factsheets were updated for Indicators 13, 14, 17, 18, 20, and 21. Pursuant to Decision IG.24/4 on Assessment Studies, monitoring and assessment tools, practices, and standards were developed, as outlined in the 2023 MED QSR report and needs assessment. Building on progress since 2019, the 2023 MED QSR was adopted by Decision IG.26/3 (COP 23, 2023). Additionally, Decision IG.26/14 (COP 23, 2023) on the Programme of Work and Budget for 2024–2025 mandated MED POL to deliver “e) IMAP pollution and marine Cluster CIs Guidance” under activity 6.2.2.

71. Referring to Working Document UNEP/MED WG.627/7/Rev.1, the Secretariat – MED POL presented one by one the updates for Common Indicators 13, 14, 17, 18, 20, and 21, providing explanations based on the achievements reviewed and agreed upon for the preparation of the 2023 MED QSR. She also provided a debrief on the revision points discussed and agreed upon during the Joint Meeting of the Correspondence Groups on Pollution and Marine Litter Monitoring (CorMons), held on 27–28 April in Anavyssos, Greece.

72. Referring to the Guidance Fact Sheets for IMAP Common Indicators 13 and 14, one Contracting Party emphasized the need to consult national and regional experts in the development of assessment methodologies. He explained that current national conditions in his country permit monitoring of only three parameters, and there is no established water classification system. He also noted that the methodologies used in the 2023 MED QSR are overly tailored to the Adriatic Sea sub-region. He recommended drawing on additional experiences, such as those of IFREMER, to ensure broader regional relevance.

73. A subsequent intervention of another Contracting Party underscored the need to explore new assessment methodologies, particularly those that do not rely on the total nitrogen to total phosphorus (TN:TP) ratio in assessing eutrophication and ecosystem productivity.

74. Another Contracting Party proposed strengthening collaboration with the COPERNICUS service to investigate the potential of developing new satellite-derived products to meet Mediterranean assessment needs. However, he cautioned that using satellite-derived data can be complex and should be approached carefully.

75. Responding to the comments, the Secretariat – MED POL recalled that the consultation process on assessment methodologies for the 2023 MED QSR was initiated during the 2020 CorMon Pollution Meeting. This included proposals for various methodologies, such as those based on the JRC Best Practice Guide, as well as the FAN (Phosphate-Ammonium-Nitrite) and FLU (FLUviality) methods. These methodologies aimed to assess the physicochemical state of coastal waters and support GES determination in Spanish waters (UNEP/MED WG.492/Inf.12). However, national experts at that time indicated that these methods were yet not applicable within their national contexts. Consequently, the Secretariat explored alternative approaches, leading to the methodologies applied in the 2023 MED QSR. These included adaptations of methodologies successfully used in the HELCOM region, such as the Ecological Quality Ratio (EQR), and its adjusted use in a format of the Simplified EQR, and the Simplified Good/Moderate (G/M) comparison method for the 2023 MED QSR. These were selected primarily due to the limited availability of *in situ* data across most sub-regions—data was available only for the Adriatic and Tyrrhenian Seas. The NEAT methodology, developed with EC support, was used where sufficient data (e.g., on Chlorophyll-a, total phosphorus, and dissolved inorganic nitrogen) were available, which was the case only in the Adriatic Sea sub-region. It was clarified that none of the applied methodologies were specifically developed for the Adriatic Sea; rather, they were chosen based on data availability.

76. In response to one of the Contracting Party's concerns about the continued use of total phosphorus in assessments, the Secretariat – MED POL emphasized that total phosphorus was included in IMAP in 2016, based on scientific consensus at the EU level within the frameworks of the WFD and MSFD. Unless a Contracting Party can provide a sound scientific rationale to exclude this parameter, supported by elaboration and discussion through the Online Working Group on Eutrophication, no changes can be presently made regarding the use of TN:TP as a fundamental indicator of eutrophication.

77. The Coordinator clarified that the current Meeting was intended to consider the proposed Guidance Fact Sheets under the "no objection" procedure. If any changes to already agreed elements are needed, they must be approached with caution to avoid deferring unresolved issues to the EcAp CG Meeting scheduled for 15 September. It was further clarified that IMAP Guidance Fact Sheets are considered evolving documents and are not subject to formal adoption at the forthcoming COP.

78. Although the use of total phosphorus had been discussed extensively during the Joint Meeting of CorMons and was included in the meeting report as an issue for the next biennia, one Contracting Party requested additional consultations with her national experts aimed at amending the Guidance Fact Sheets. Following the discussion, the two following additions were proposed and, with the agreement of the Meeting, included in the Guidance Fact Sheet for IMAP Common Indicator 13: i) **Indicator Definition:** "*Further actions should include scientific elaboration on the adjusted use of the total nitrogen to total phosphorus ratio in assessing eutrophication and ecosystem productivity in relevant Mediterranean sub-regions or sub-divisions, taking into account local ecosystem specificities.*"; and ii) **Assessment Criteria:** "*Future efforts should also address the need to establish assessment criteria for phosphate.*"

79. Following the Meeting's agreement on the proposed amendments, the IMAP Guidance Fact Sheets for Common Indicators 13 and 14 were endorsed, under the No Objection Procedure.

80. Regarding Indicators 17 and 18, one Contracting Party suggested conducting both target and non-target analyses using advanced technology capable of detecting the presence of thousands of substances. As this approach significantly reduces monitoring costs, it was recommended to organize joint monitoring cruises.

81. Regarding bathing water quality, one Contracting Party suggested the harmonization of monitoring parameters set in Bathing Water Directive and IMAP. Specifically, it was proposed that monitoring both traditional *Escherichia coli* and *intestinal enterococci* in marine waters should be mandatory within IMAP, to ensure consistency in status classification.

82. In response, the Secretariat – MED POL explained that the implementation of bathing water quality monitoring had demonstrated that *intestinal enterococci* is more appropriate than *Escherichia coli* as an indicator of fecal pollution in marine waters. Therefore, for IMAP Common Indicator 21, the monitoring of *intestinal enterococci* has been set as mandatory in 2012 (Decision IG.20/9 on *Criteria and standards for Bathing Water Quality* (COP 7, Paris 2012)). This decision was also guided by the need to reduce monitoring costs and align monitoring efforts with available national resources. A similar approach was adopted for eutrophication monitoring, which under IMAP includes physico-chemical parameters but not biological parameters, as are included under the MSFD. Furthermore, by applying the "one-out, all-out" assessment approach, potential bias is avoided when comparing EEA assessments (which are based on both parameters) with IMAP assessments (which are based on concentration categories of *intestinal enterococci*, as outlined in Decision IG.20/9 on *Criteria and Standards for Bathing Water Quality*, adopted under Article 7 of the LBS Protocol at COP 17, Paris, 2012). Any change to these substantive elements, which are grounded in the use of available scientific evidence, must be supported by relevant scientific justification. Additional progress can be achieved by ensuring that all countries report data to the IMAP Information System. This would eliminate the need to rely on external assessment findings, including those of the EEA, for bathing water quality.

83. In conclusion, the Coordinator highlighted the evolving nature of IMAP Guidance Fact Sheets and confirmed that the proposal related to bathing water quality would be reflected in the meeting report to support any future consideration within the CorMon framework.

84. Following the amendment IMAP Guidance Fact Sheet related to eutrophication, the Working Document UNEP/MED WG.627/7/Rev.1 — as reflected in Appendix IV of the Conclusions and Recommendations — was endorsed for submission to the 12th Meeting of the Ecosystem Approach Coordination Group (EcAp CG), scheduled for 15 September 2025.

85. The Secretariat - MED POL presented Working Document WG.627/8/Rev.1, which includes the updated Guidance Factsheets for IMAP Candidate Common Indicators 26 and 27.

86. Referring to this document, the Secretariat - MED POL outlined the updates for both indicators, explaining each revision in detail based on the achievements reviewed and agreed upon

during the preparation of the 2023 MED QSR. She also provided a summary of the key revision points discussed and agreed upon at the Joint Meeting of the Correspondence Groups on Pollution and Marine Litter Monitoring (CorMons).

87. One Contracting Party suggested that further modifications be made to the IMAP Guidance Factsheets for Candidate Common Indicators 26 and 27. This proposal was based on a technical review of the document conducted by a national expert who is a member of the MSFD Technical Group on Underwater Noise (TG Noise). As this expert was unable to attend the Joint CorMons Meeting, the proposal was submitted in writing to the Secretariat during the current meeting.

88. In response, the Secretariat – MED POL clarified that all proposals must be shared with all Contracting Parties during the meeting. Consequently, the comments were briefly introduced by the country's representative.

89. To allow for proper consideration of the submission of this Contracting Party, the following two additions—aimed at addressing identified technical omissions—were proposed and subsequently agreed upon by the Meeting:

- Candidate Common Indicator 26, Targets: “Upon building the register, which includes information on the number of impulsive noise events associated with activity – for example, in the case of pile driving - the number of strikes performed daily, or in the case of explosions – the number of explosions occurring daily,”
- Candidate Common Indicator 27, Justification: “underwater explosions, geophysical surveys with the use of air guns, sonar or acoustic deterrents, pile driving”.

90. To align the present document with the revised GES target for Candidate Common Indicator 26, as outlined in UNEP/MED WG.627/4/Rev.1, the same addition, “for a limited amount of time”, was included in the Guidance Fact Sheet for Candidate Common Indicator 26.

91. In line with the Coordinator's position on the need to respect the communication flow between the MED POL Focal Points and the CORMONs, the Meeting agreed to share the *Updated Guidance Factsheets for IMAP Common Indicators 13, 14, 17, 18, 20, and 21* and the *Updated Guidance Factsheets for IMAP Candidate Common Indicators 26 and 27* with the participants of the Joint Meeting of the Ecosystem Approach Correspondence Groups on Pollution and Marine Litter Monitoring (Anavyssos, Greece, 27–28 May 2025). This is to ensure there are no objections regarding the minor modifications introduced in the Guidance Factsheets for Common Indicator 13 and Candidate Common Indicators 26 and 27.

92. Following the amendments to the IMAP Guidance Fact Sheets for Candidate Common Indicators 26 and 27 — and reaffirming the decision to defer the elevation of these candidate indicators to common noise indicators to the Ecosystem Approach Coordination Group — the Working Document WG.627/8/Rev.1, as presented in Appendix IV of the Conclusions and Recommendations, was endorsed for submission to the 12th Meeting of the Ecosystem Approach Coordination Group (EcAp CG), scheduled for 15 September 2025.

Agenda item 6: Reporting Format on the Land Based Sources (LBS) Protocol Implementation

93. Under this agenda item, the Secretariat – MED POL introduced Working Document UNEP/MED WG.627/6, entitled “Revised Reporting Format of the Land-Based Sources (LBS) Protocol”, by outlining proposed changes to it.

94. The Secretariat – MED POL further clarified changes made to the reporting tables, specifically highlighting the proposed modifications to Table III regarding the six regional plans, as well as the introduction of a new Table IV (bis) on NAPs, which replaces the previous Table (IV). It was emphasized that the reporting format is shifting toward the collection of more quantitative data, rather than qualitative data, in line with the improving data collection capacity of the Contracting Parties and, consequently, of the region.

95. One Contracting Party highlighted the need to develop a glossary of reporting terminology to support more efficient and harmonized reporting by the CPs.

96. The Secretariat – MED POL highlighted the growing number of “reporting entries,” referring to obligations stemming from specific articles of various decisions and regional plans.

97. The Coordinator emphasized that, while reporting requirements have expanded with the adoption of new plans, there is also a pressing need to systematically review older regional plans and to seek guidance from Contracting Parties on whether the reporting obligations under these older plans should be maintained or revised.

98. The Meeting approved the proposed reporting format and requested the Secretariat – MED POL to prepare a glossary of reporting terminology, and to evaluate the submitted reports related to old regional plans, with a view to seeking guidance from the Contracting Parties on the future of the reporting obligations stemming from these plans.

Agenda item 7: Emerging issues: Marine renewable Energies

99. Under this agenda item, the Secretariat – MED POL presented Working Document UNEP/MED WG.627/9, titled “Analysis of Existing Regulatory Measures and Impacts on the Marine and Coastal Environment from Marine Renewable Energies”, in particular, the detailed assessment of existing legal frameworks at both national and regional levels, the potential environmental impacts associated with the development of Marine Renewable Energy (MRE), and the proposed measures to mitigate these impacts.

100. The representative of the European Union, Mr. Georg Hanke, referred to the report titled “Cumulative Impacts of Offshore Wind Farm Expansions: Consequences & Solutions for Achieving GES across European Marine Waters”, noting that while the report has not yet been published, the final draft has recently been released for public consultation. He invited the Secretariat – MED POL and meeting participants to review and provide feedback through the open public consultation process.

101. Some Contracting Parties proposed revisions to the text, specifically to incorporate recent developments in national legal frameworks, strategies, and plans, and to remove any references pertaining to areas outside the Mediterranean region. At the end of this agenda item, the meeting took note of the document “Analysis on existing regulatory measures and impacts on marine and coastal environment from Marine Renewable Energies” (UNEP/MED WG.627/9) and endorsed the proposed recommendations. It was also agreed to provide the Contracting Parties, which would wish to do so, sufficient time for any additional comment to the document but not later than 4 July 2025.

Agenda item 8: Recent developments in pollution control and future measures

102. Under this agenda item, the Secretariat - MED POL presented Working Document UNEP/MED WG.627/10 “Analysis of Global and Regional Policies relevant to the LBS Protocol, including emerging issues” and outlined additional measures and emerging issues that the Contracting Parties could consider when identifying priority measures for reduction and control during the preparation/update of NAPs, particularly those stemming from legally binding global resolutions, including those adopted by UNEA. The Secretariat – MED POL further explained the methodology used to identify gaps and how the proposed measures were developed.

103. The representative of the EU welcomed the findings of the document, particularly emphasizing the importance of further addressing the issue of lead in paints. He also highlighted the ongoing efforts at the EU level regarding the regulation of lead in hunting ammunition and suggested aligning this initiative with regional actions to ensure coherence and effectiveness.

104. The Meeting acknowledged the identified gaps and findings, approved the recommendations presented in the document, and requested the Secretariat to consider these recommendations during the preparation of the new Medium-Term Strategy (MTS) to ensure their integration at the regional level.

Agenda item 9: Proposed MED POL Activities 2026-2027.

105. Under this Agenda item, the Secretariat presented Working Document UNEP/MED WG.627/11 “*Proposed MED POL Activities for MAP Programme of Work 2026-2027*”, which lists and details the activities proposed by MED POL for inclusion to the UNEP/MAP Programme of Work for the biennium 2026-2027. The Secretariat – MEDPOL explained the rationale for developing the Programme of Work, its targets and key activities, and presented each output/deliverable planned under Programmes, 1 on “Pollution”, 4 on “Towards the Sustainable Use of Coastal and Marine Resources Including Circular and Blue Economy”, 5 on “Governance”, and 6 on “Towards Monitoring, Assessment, Knowledge and Vision of the Mediterranean Sea and Coast for Informed Decision-Making” of the MAP Mid-Term Strategy (2022-2027)..

106. Reference to Activity 1.2.3 of the proposed MED POL activities under the MAP Programme of Work 2026–2027, the representative of Malta, reminded the Meeting on the ongoing bilateral discussion with the Secretariat - MED POL and expressed their interest to host in 2026 a meeting on desalination(tbc), including a possible visit to a desalination plant.

107. One Contracting Party emphasized the importance of providing assistance and capacity-building support to CPs for IMAP Pollution and Marine Litter (ML) monitoring. The Secretariat – MED POL noted that this is a core component of the Programme of Work 2026–2027, which includes activities for Contracting Parties under Programme 6.

108. The Secretariat – MED POL outlined planned support for Contracting Parties under the proposed Programme of Work, highlighting assistance to seven countries for implementing IMAP indicators related to eutrophication (EO5), contaminants (EO9), and marine litter (EO10), as well as support to four countries on riverine marine litter. The assistance will include the training courses which will be organized in collaboration with the IAEA-MESL to provide hands-on training on data collection and analytical determination of heavy metals and organic compounds (Indicator 17), heavy metals, organic compounds, and dioxins in seafood (Indicator 20), and eutrophication parameters such as nutrients and chlorophyll-a in high and low salinity waters (Common Indicators 13 and 14). The knowledge transfer to IMAP competent laboratories is foreseen also within these activities.

109. The Coordinator highlighted that this biennium marks the final phase of the Mid-Term Strategy (MTS), with activities focused on building upon past achievements and addressing gaps. The MED POL Programme has strengthened its capacity through new staff recruitments, and despite limited MTF resources, MED POL remains committed to providing technical assistance and capacity-building to Contracting Parties. Additional funding, including through a new GEF project, will be pursued. The Coordinator encouraged Southern Mediterranean countries to explore EU and donor partnerships and reaffirmed the Secretariat’s support for NAPs implementation, monitoring, and preparing the next Quality Status Report (QSR).

110. At the conclusion of this agenda item, the Meeting approved the MED POL activities for the 2026–2027 biennium, as presented in Appendix VI of the Conclusions and Recommendations, and endorsed their inclusion in the MAP Programme of Work. The Meeting also emphasized the importance of securing adequate financial resources to ensure the effective implementation of the activities which are essential for fulfilling key commitments.

Agenda item 10: Conclusions and Recommendations

111. The Meeting reviewed, the draft Conclusions and Recommendations presented on the screen during the plenary and consequently approved with some modifications as presented as in Annex III of this report.

Agenda 11: Any Other Business

112. Under this agenda item, the representative of the European Union, Mr. Georg Hanke, delivered a presentation titled “Global Monitoring of Plastic/Marine Litter: A Plea”. The presentation emphasized the various types of monitoring required to effectively support plastic and marine litter mitigation efforts. He also referenced available guidelines for monitoring coastline macro litter, floating macro litter at sea and on rivers, as well as seabed macro litter. Mr. Hanke additionally suggested several follow-up considerations for further action at regional level.

Agenda Item 12: Closure of the Meeting

113. After expressing the usual courtesies, the Chair declared the Meeting closed at 17:30 on Wednesday, 19 June 2025.

Annex I
List of Participants

**REPRESENTATIVES OF THE CONTRACTING PARTIES / REPRESENTANTS DES
PARTIES CONTRACTANTES**

ALBANIA/ALBANIE	Ms Elvana Ramaj Director of Circular Economy Ministry of Tourism and Environment Ms Shpesa Domi Head of Sector for Foreign Assistance Ministry of Tourism and Environment, Albania
BOSNIA AND ERZEGOVINA / BOSNIE ET HERZEGOVIE	Ms Čengić Selma Deputy Director Hydro Engineering Institute Sarajevo Ms. Dalila Jabucar Hydro Engineering Institute Sarajevo
CYPRUS/CHYPRE	Mr. Konstantinos Antoniadis Officer of Fisheries and Marine Research
EUROPEAN COMMISSION / COMMISSION EUROPÉENNE	Mr. Georg Hanke Policy Officer European Commission Joint Research Centre
EGYPT/EGYPTE	Mr. Ayoub Sameh Egyptian Environmental Affairs Agency
FRANCE/FRANCE	Ms. Alexane Lovat French Ministry for the Ecological Transition, Biodiversity, Forests, Marine Affairs, and Fisheries
GREECE/GRECE	Ms. Kalliopi Pagkou Hellenic Centre for Marine Research Research Director at the Institute of Oceanography
LEBANON/LIBAN	Ms. Celine Mahfouz National Council for Scientific Research Lebanon (CNRS-L) Mr. Bassam Sabbagh Head of Urban Environment Service - MEDPOL focal point Ministry of Environment
MALTA/MALTE	Ms. Annabelle Haber Environment & Resources Authority Ms. Juliane Baldacchino Assistant Environment Protection Officer
MONTENEGRO/ MONTENEGRO	Ms. Ivana Mitrovic Advisor - Department of Nature Protection, Monitoring, Analysis and Reporting Environmental Protection Agency

	Ms. Marina Markovic NAP Consultant
MOROCCO/MAROC	Mr. Mohammed EL Bouch Ministry of Sustainable development Project manager
STATE OF LIBYA/ETAT DE LIBYE	Mr. Ahmed Abugdera Ministry of Environment Environmental Expert Mr. Salih Diryaq Ministry of Environment Environmental Expert
TUNISIA/TUNISIE	Mr. Yassine Marzougui Agence Nationale de Protection de l'Environnement General Director MedPol National Focal Point
TURKIYE/TURKIYE	Mr. Mehmet Tamer Çobanoğlu Ministry of Environment, Urbanization and Climate change Expert

**COMPONENTS OF THE MEDITERRANEAN ACTION PLAN
PROGRAMME DES NATIONS UNIES POUR L'ENVIRONNEMENT - UNITÉ DE
COORDINATION ET COMPOSANTES DU PLAN D'ACTION POUR LA MÉDITERRANÉE**

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	Mr. Christos Ioakeimidis Quality Status Report (QSR) Programme Management Officer E-mail: christos.ioakeimidis@un.org Mr. Dimitrios Fragkiskos Lekkas Consultant Ms Magali Outters Consultant
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Annex II
Agenda of the Meeting

Agenda

- Agenda item 1:** Opening of the Meeting.
- Agenda item 2:** Organizational Matters.
- Agenda item 3:** Updated National Action Plans /Programmes of Measures 2025-2035
- Agenda item 4:** Status of implementation of MED POL activities during 2024-2025 biennium, including related Projects (MedProgramme, ML MED PLUS Project, and EcAp MED PLUS Project)
- Agenda item 5:**
 - a) Enhanced EcAp Policy and its implementation (GES, Targets, Governance)
 - b) Enhanced Integrated Monitoring and Assessment Programme (IMAP) (Pollution and Marine Litter cluster, Common Indicators updated fact sheets, assessment criteria/thresholds)
- Agenda item 6:** Reporting Format on the Land Based Sources (LBS) Protocol Implementation
- Agenda item 7:** Emerging issues: Marine renewable Energies
- Agenda item 8:** Recent developments in pollution control and future measures.
- Agenda item 9:** Proposed MED POL Activities 2026-2027
- Agenda item 10:** Any other Business
- Agenda item 11:** Conclusions and Recommendations
- Agenda item 12:** Closure of the Meeting

Annex III
Conclusions and Recommendations
Conclusions et recommandations

Conclusions and Recommendations

On 17-19 June 2025, the MED POL Focal Points Meeting was held in Athens, Greece. The Meeting was organized by UNEP/MAP Secretariat (MED POL Programme). Further to its deliberations, the Meeting reached the following conclusions:

Agenda Item 3: Updated National Action Plans /Programmes of Measures 2025-2035

1. The meeting acknowledged and appreciated the progress made by the Contracting Parties in the preparation of their National Action Plans (NAPs), particularly in developing the Programmes of Measures. It emphasized the importance of this process and urged the Contracting Parties to finalize their NAPs. Additionally, it called on Contracting Parties that are also EU Member States to submit their Programmes of Measures instead of the NAP as appropriate prior to the MAP Focal Points meeting (16-19 September 2025).
2. The meeting requested the Secretariat to continue its support to the Contracting Parties including joint national meetings, where possible to ensure NAPs' finalization.

Agenda item 4: Status of implementation of MED POL activities during 2024-2025 biennium, including related Projects (MedProgramme, ML MED PLUS Project, and EcAp MED PLUS Project)

3. Following the presentation by the Secretariat of Working document UNEP/MED WG.627/3: *"Progress achieved regarding implementation of the Programme of Work 2024-2025, including MedProgramme and other Projects (ML MED PLUS Project and EcAp MED PLUS Project)"* the Meeting acknowledged the progress achieved and expressed its appreciation for the efforts of the Secretariat - MED POL and the Contracting Parties in delivering the planned outputs mandated by the Programme of Work for the 2024–2025 biennium.

Agenda item 5: a) Enhanced EcAp Policy and its implementation (GES, Targets, Governance)

4. Following the presentation by the Secretariat of Working Document UNEP/MED WG.627/4/Rev.1 *"Enhanced EcAp Policy and its Implementation"*, the Meeting reviewed and endorsed the revised Operational Objectives, IMAP Common Indicators, definitions of Good Environmental Status (GES), and associated Targets for Ecological Objectives 5 (Eutrophication), 9 (Pollution), 10 (Marine Litter), and 11 (Noise) as set out in Appendix I to the conclusions and recommendations. The Meeting also endorsed the terms of Reference (TORs) for Ecosystem Approach Correspondence Groups on Monitoring (CORMONs), and Online Working Groups (OWGs), and Flow of Work as set out in Appendix II to the conclusions and recommendations. The meeting agreed to submit them to the MAP Focal Points Meeting, (on 16-19 September 2025) through the 12th Meeting of the Ecosystem Approach Coordination Group (EcAp CG) scheduled to be held on 15 September 2025.
5. The Meeting reviewed Working Document UNEP/MED WG.627/5/Rev.1, *"Revised IMAP: Pollution, Litter and Noise Cluster"*. It considered the updated elements related to the respective Common [and Candidate] Indicators IMAP Ecological Objectives EO5, EO9, EO10, and EO11, including related assessment criteria acknowledging their evolving nature. It was highlighted that the quantitative assessment based on the application of assessment criteria should be accompanied by qualitative assessment of the actual impacts, so that a realistic assessment of the level of the pressures can be provided. The meeting:

- (a) Agreed on the changes proposed for paragraph 51 addressing Common Indicator 23 (seafloor marine litter) given that the proposed additional elements/clarifications were already included in the respective guidance factsheets approved by the CORMON meetings; and
- (b) Acknowledged the significant impact of noise on biodiversity but considering existing technical and financial constraints, and the need for further consultation at the national level invites the EcAp Coordination Group to take the final decision whether Candidate Indicators 26 and 27 can be upgraded as Common Indicators in their meeting to be held on 15 September 2025.
6. The Meeting endorsed the proposed updated sections of IMAP for Pollution, Litter and Noise related (EOs 5, 9, 10 and 11), as set out in Appendix III to the conclusions and recommendations, and its subsequent submission to the MAP Focal Points Meeting (on 16-19 September 2025), through the 12th Meeting of the Ecosystem Approach Coordination Group (EcAp CG) scheduled to be held on 15 September 2025.

Agenda item 5: b) Enhanced Integrated Monitoring and Assessment Programme (IMAP) (Pollution and Marine Litter cluster, Common Indicators updated fact sheets, assessment criteria/thresholds)

7. Following the presentation of the “*Updated Guidance Factsheets for IMAP Common Indicators 13, 14, 17, 18, 20, and 21*” (UNEP/MED WG.627/7/Rev.1) and the “*Updated Guidance Factsheets for IMAP Candidate Common Indicators 26 and 27*” (UNEP/MED WG.627/8/Rev.1), the Meeting through the No Objection Procedure recommended their submission, as set out in Appendix IV to the conclusions and recommendations, for approval by the 12th EcAp Coordination Group in September 2025.
8. The Meeting acknowledged the need for national experts contributing to the Ecosystem Approach Coordination Group on Pollution Monitoring, and the Secretariat – MED POL, to address the following priorities in order to enhance the accuracy and consistency of the future Good Environmental Status (GES) assessments in the Mediterranean:
- Scientifically elaborate on the adjusted use of the total nitrogen to total phosphorus ratio in assessing eutrophication and ecosystem productivity in relevant Mediterranean sub-regions or sub-divisions, taking into account local ecosystem specificities;
 - Investigate potential discrepancies in assessments that may arise from the use of *Intestinal enterococci* as specified in IMAP Common Indicator 21, compared to the combined use of *Intestinal enterococci* and *Escherichia coli* as outlined in Directive 2006/7/EC on Bathing Water Quality;
 - Ensure optimal harmonization of future work on noise monitoring and assessment with the activities of the MSFD Technical Group on Noise;
 - Explore new assessment methodologies to further enhance harmonized GES assessment across Mediterranean sub-regions for the third iteration of the MED QSR, building upon the methodologies applied in the preparation of the 2023 MED QSR.
9. In order to respect the communication and flow of work between MED POL FPs meeting and CORMONs, the Meeting agreed with the Secretariat proposal to share the “Updated Guidance Factsheets for IMAP Common Indicators 13, 14, 17, 18, 20, and 21” and the “Updated Guidance Factsheets for IMAP Candidate Common Indicators 26 and 27”, to the participants of the Joint Meeting of the Ecosystem Approach Correspondence Groups on Pollution and Marine Litter Monitoring (Anavyssos, Greece, 27 -28 May 2025), to ensure that there is no objection in relation to a few modifications introduced in the Guidance Factsheets for Common Indicator 13, and candidate Common Indicators 26 and 27.

Agenda item 6: Reporting Format on the Land Based Sources (LBS) Protocol Implementation

10. The Meeting agreed on the Reporting Format as proposed by the Secretariat and set out in Appendix V to the conclusions and recommendations for submission to the MAP Focal Points for their consideration. With regards to Table IV on NAP indicators, the Meeting highlighted the need for

applying a certain level of flexibility on reporting frequency due to the challenges associated with data collection.

11. The Meeting requested the Secretariat to examine in collaboration with the Contracting Parties the status of the implementation of the Regional Plans adopted between 2009 and 2013, considering that most of the timeframes for the implementation of the measures provided in these Plans were until 2025 at the latest and report to the next MED POL FP meeting in 2027 together with the proposal for keeping or removing as appropriate this section from the Barcelona Convention Reporting System.

12. The Meeting requested the Secretariat to update/prepare a glossary or a guidance document, in order to support and guide the Contracting Parties for the preparations of the reports in the next reporting cycle.

Agenda item 7: Emerging issues: Marine renewable Energies

13. The meeting took note of the document “*Analysis on existing regulatory measures and impacts on marine and coastal environment from Marine Renewable Energies*” (UNEP/MED WG.627/9) and endorsed the proposed recommendations. It was also agreed to provide the Contracting Parties, which would wish to do so, sufficient time for any additional comment to the document but not later than 4 July 2025.

14. The meeting requested the Secretariat to consider the issue of Marine Renewable Energy (MRE) as one of the issues to be addressed in the new MTS in long term, acknowledging that there is a proposal to prepare guidelines to promote sustainable MRE in the PoW for the 2026–2027 biennium.

Agenda item 8: Recent developments in pollution control and future measures.

15. The meeting took note of the document, namely “*Global and Regional Policies relevant to LBS Protocol, including New Emerging Issues*” (UNEP/MED WG.627/10). It acknowledged the efforts of Contracting Parties to include the identified measures, where appropriate, for complementing their NAPs, in order to facilitate potential synergies with other relevant global obligations.

Agenda item 9: Proposed MED POL Activities 2026-2027.

16. The Meeting took note of the MED POL activities included in the Programme of Work for the upcoming biennium (2026–2027) as set out in Appendix VI and endorsed their integration into the MAP Programme of Work. Several participants highlighted the importance of ensuring continued support to countries in strengthening the monitoring and assessment of pollution and marine litter, including riverine litter, and implementation of the National Action Plans.

17. The Meeting also underscored the need for adequate financial resources to enable the effective implementation of these priority activities, which are essential for fulfilling key commitments.

Conclusions et recommandations

Du 17 au 19 juin 2023, la Réunion des Points Focaux MED POL s'est tenue à Athènes, Grèce. La réunion a été organisée par le Secrétariat du PNUE/PAM (Programme MED POL). À l'issue de ses délibérations, la réunion est parvenue aux conclusions suivantes :

Point 3 de l'ordre du jour : Plans d'action nationaux / Programmes de mesures actualisés 2025-2035

1. La réunion a reconnu les progrès accomplis par les Parties Contractantes dans la préparation des Plans d'Action Nationaux (PAN), en particulier les programmes de mesures, et a souligné l'importance de ce processus et a exhorté les Parties Contractantes à finaliser leurs PAN. Elle a également demandé aux Parties Contractantes également membres de l'UE de soumettre leur programme de mesures avant la réunion des Points focaux du PAM.
2. La réunion a demandé au Secrétariat de poursuivre son soutien complet aux Parties Contractantes, y compris par l'organisation de réunions nationales conjointes, lorsque cela est possible, afin d'assurer leur finalisation.

Point 4 de l'ordre du jour : Etat d'avancement de la mise en œuvre des activités de MED POL durant le biennium 2024-2025, y compris les projets associés (MedProgramme, projet ML MED PLUS et projet EcAp MED PLUS)

3. À la suite de la présentation par le Secrétariat du document de travail UNEP/MED WG.627/3 « *Progrès réalisés dans la mise en œuvre du Programme de travail 2024-2025, y compris le MedProgramme et d'autres projets (projet ML MED PLUS et projet EcAp MED PLUS)* », la réunion a pris acte des progrès réalisés et a salué le travail accompli par MED POL et les Parties Contractantes pour atteindre les résultats prévus conformément au programme de travail du biennium 2024-2025.

Point 5a de l'ordre du jour : a) En Renforcement de la politique EcAp et de sa mise en œuvre (BEE, objectifs, gouvernance)

4. À la suite de la présentation par le Secrétariat du document de travail UNEP/MED WG.627/4/Rev.1 « *Politique renforcée d'EcAp et sa mise en œuvre* », la réunion a examiné et approuvé les objectifs opérationnels révisés, les indicateurs communs IMAP, les définitions du Bon État Environnemental (BEE) ainsi que les cibles associées aux objectifs écologiques 5 (Eutrophisation), 9 (Pollution), 10 (Déchets marins) et 11 (Bruit), tels qu'exposés en Annexe I aux conclusions et recommandations. La réunion a également approuvé les termes de référence (TdR) des groupes de correspondance de l'approche écosystémique sur le suivi (CORMON), des groupes de travail en ligne (GTL) et du déroulement des travaux, tels qu'indiqués en Annexe II aux conclusions et recommandations. La réunion a convenu de les soumettre à la réunion des points focaux de la PAM, par l'intermédiaire de la 12^e réunion du groupe de coordination de l'approche écosystémique (EcAp CG) prévue les 15 et 16–19 septembre 2025.
5. La Réunion a examiné le document de travail UNEP/MED WG.627/5/Rev.1, intitulé « *IMAP révisé: Groupe Pollution, Déchets et Bruit* ». Elle a étudié les éléments mis à jour relatifs aux Indicateurs Communs [et Candidats] respectifs des Objectifs Écologiques IMAP OE5, OE9, OE10 et OE11, y compris les critères d'évaluation associés, en reconnaissant leur nature évolutive. Il a été souligné que l'évaluation quantitative fondée sur l'application des critères d'évaluation devrait être accompagnée d'une évaluation qualitative des impacts réels, afin de fournir une évaluation réaliste du niveau des pressions. La réunion.

(a) A approuvé les modifications proposées au paragraphe 51 concernant l'Indicateur Commun 23 (déchets marins sur le fond marin), étant donné que les éléments/clarifications supplémentaires

proposés étaient déjà inclus dans les fiches techniques d'orientation respectives approuvées par les réunions CORMON ; et

(b) A reconnu l'impact significatif du bruit sur la biodiversité, mais, compte tenu des contraintes techniques et financières existantes et de la nécessité de consultations supplémentaires au niveau national, invite le Groupe de coordination EcAp à prendre une décision finale quant à la possibilité de reclasser les Indicateurs Candidats 26 et 27 en tant qu'Indicateurs Communs lors de sa réunion prévue le 15 septembre 2025.

6. La réunion a approuvé les sections mises à jour proposées de l'IMAP concernant la pollution, les déchets et le bruit (objectifs écologiques 5, 9, 10 et 11), telles qu'exposées en Annexe III aux conclusions et recommandations, ainsi que leur soumission ultérieure à la réunion des Points focaux du PAM (les 16–19 septembre 2025.), via la 12^e réunion du groupe de coordination de l'approche écosystémique (EcAp CG) prévue le 15 septembre 2025.

Point 5b de l'ordre du jour : Programme intégré renforcé de surveillance et d'évaluation (IMAP) (Pollution et déchets marins, fiches mises à jour des indicateurs communs, critères et seuils d'évaluation)

7. A la suite de la présentation des « *Fiches techniques d'orientation mises à jour pour les indicateurs communs de l'IMAP 13, 14, 17, 18, 20 et 21* » (UNEP/MED WG.627/7/Rev.1) et des « *Fiches techniques d'orientation mises à jour pour les indicateurs communs candidats de l'IMAP 26 et 27* » (UNEP/MED WG.627/8/Rev.1), la Réunion a recommandé, par procédure d'absence d'objection, leur soumission, telle qu'énoncée à l'annexe IV des conclusions et recommandations, pour approbation par la 12^e Réunion du Groupe de coordination de l'Approche Écosystémique (EcAp) en septembre 2025.

8. La Réunion a reconnu la nécessité, pour les experts nationaux contribuant au Groupe de coordination de l'Approche Écosystémique sur le suivi de la pollution, ainsi que pour le Secrétariat – MED POL, de traiter les priorités suivantes afin d'améliorer la précision et la cohérence des futures évaluations du Bon État Écologique (BEE) en Méditerranée :

- Élaborer scientifiquement sur l'utilisation ajustée du rapport azote total / phosphore total dans l'évaluation de l'eutrophisation et de la productivité des écosystèmes dans les sous-régions ou subdivisions méditerranéennes pertinentes, en tenant compte des spécificités locales des écosystèmes ;
- Examiner les éventuelles divergences dans les évaluations pouvant découler de l'utilisation des entérocoques intestinaux telle que spécifiée dans l'Indicateur Commun IMAP 21, par rapport à l'utilisation combinée des entérocoques intestinaux et d'*Escherichia coli* telle que définie dans la Directive 2006/7/CE relative à la qualité des eaux de baignade ;
- Garantir une harmonisation optimale des travaux futurs sur la surveillance et l'évaluation du bruit avec les activités du Groupe technique sur le bruit de la Directive cadre stratégie pour le milieu marin (DCSMM) ;
- Explorer de nouvelles méthodologies d'évaluation afin de soutenir une évaluation harmonisée du Bon État Écologique (BEE) à travers les sous-régions méditerranéennes pour la troisième itération du Rapport d'État de l'Environnement Marin en Méditerranée (MED QSR), en s'appuyant sur les méthodologies appliquées lors de la préparation du MED QSR 2023

9. Afin de respecter la communication et le déroulement des travaux entre la réunion des points focaux MED POL et les CORMON, la réunion a accepté la proposition du Secrétariat de partager les « *Fiches d'orientation mises à jour pour les indicateurs communs IMAP 13, 14, 17, 18, 20 et 21* » ainsi que les « *Fiches d'orientation mises à jour pour les indicateurs communs candidats IMAP 26 et 27* » avec les participants à la réunion conjointe des groupes de correspondance de l'approche écosystémique sur le suivi de la pollution et des déchets marins (Anavyssos, Grèce, 27-28 mai 2025), afin de garantir qu'aucune objection ne soit soulevée concernant quelques modifications introduites

Point de l'ordre du jour 6 : Format de rapport sur la mise en œuvre du Protocole relatif à la protection de la mer Méditerranée contre la pollution d'origine tellurique (LBS)

10. La réunion a adopté le format de rapport proposé par le Secrétariat, tel que présenté en Annexe V aux conclusions et recommandations, en vue de sa soumission aux points focaux de la PAM pour examen. Concernant le tableau IV sur les indicateurs des plans d'action nationaux (PAN), la réunion a souligné la nécessité d'appliquer un certain niveau de flexibilité quant à la fréquence des rapports, en raison des difficultés liées à la collecte des données.

11. La réunion a demandé au Secrétariat d'examiner l'évaluation finale des anciens Plans régionaux afin d'analyser leur niveau de mise en œuvre dans les délais impartis et de formuler des recommandations sur la possibilité de leur exclusion, si nécessaire, du Système de rapport de la Convention de Barcelone pour la prochaine réunion des Points focaux MED POL.

12. La réunion a demandé au Secrétariat de mettre à jour ou de préparer un glossaire pour le format de rapport, qui guidera et facilitera les Parties Contractantes lors de leurs rapports pour le prochain cycle de rapport.

Point de l'ordre du jour 7 : Secteurs émergents : Énergies marines renouvelables

13. La réunion a pris note du document « *Analyse des mesures réglementaires existantes et de leurs impacts sur le milieu marin et côtier liés aux énergies marines renouvelables* » (UNEP/MED WG.627/9) et a approuvé les recommandations proposées. Il a également été convenu de laisser aux Parties Contractantes qui le souhaitent un délai suffisant pour formuler des commentaires supplémentaires sur le document, délai qui ne devra pas dépasser le 4 juillet 2025.

14. La réunion a demandé au Secrétariat de prendre en considération la question des énergies marines renouvelables (EMR) comme l'un des sujets à aborder dans le nouveau SMT à long terme, en reconnaissant qu'une proposition existe pour préparer des lignes directrices visant à promouvoir les EMR durables dans le programme de travail pour le biennium 2026–2027.

Point de l'ordre du jour 8 : Développements récents dans le contrôle de la pollution et mesures futures

15. La réunion a pris note du document intitulé « *Politiques globales et régionales pertinentes au Protocole sur les apports de polluants par les sources terrestres (LBS), y compris les nouveaux enjeux émergents* » (UNEP/MED WG.627/10). Elle a reconnu les efforts des Parties Contractantes pour inclure, lorsque cela est approprié, les mesures identifiées afin de compléter leurs plans d'action nationaux (PAN), dans le but de faciliter les synergies potentielles avec d'autres obligations mondiales pertinentes.

Point 9 de l'ordre du jour : Activités MED POL proposées pour 2026–2027

16. La réunion a pris note des activités de MED POL incluses dans le programme de travail pour le prochain biennium (2026–2027) telles qu'énoncées à l'annexe VI des Conclusions et Recommandations, et a approuvé leur intégration dans le programme de travail de la PAM. Plusieurs participants ont souligné l'importance d'assurer un soutien continu aux pays pour renforcer le surveillance et l'évaluation de la pollution et des déchets marins, y compris les déchets fluviaux, ainsi que la mise en œuvre des plans d'action nationaux

17. La réunion a également insisté sur la nécessité de disposer de ressources financières adéquates afin de permettre la mise en œuvre effective de ces activités prioritaires, essentielles à l'accomplissement des engagements clés.

Appendix 1

Revised Operational Objectives, IMAP Common Indicators, definitions of Good Environmental Status (GES), and associated Targets for Ecological Objectives 5 (Eutrophication), 9 (Pollution), 10 (Marine Litter), and 11(Noise)

Table 1: Operational Objectives, IMAP Common Indicators, GES Definitions and Revised Targets for Ecological Objectives 5 and 9.

Ecological Objective 5 (EO5): Human-induced eutrophication is prevented, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algal blooms and oxygen deficiency in bottom waters			
Operational Objective	Indicator	GES	Revised Targets
5.1 Human introduction of nutrients in the marine environment is not conducive to eutrophication	5.1.1 Concentration of key nutrients in the water column (IMAP Common Indicator 13)	Concentrations of nutrients in the euphotic layer are in line with prevailing physiographic, geographic and climate conditions	State: - Reference nutrients concentrations according to the local hydrological, chemical, and morphological characteristics of the un- impacted marine region. - Decreasing trend of nutrients concentrations in water column of human impacted areas statistically defined, considering the boundary limit between GES and non-GES classes of the assessment scales. Pressure: - Reduction of BOD emissions from land-based sources. - Reduction of nutrients emissions from land-based sources.
5.2 Direct and indirect effects of nutrient over- enrichment are prevented	5.2.1 Chlorophyll-a concentration in the water column (IMAP Common Indicator 14)	Natural levels of algal biomass, water transparency and oxygen concentrations in line with prevailing physiographic, geographic, and weather conditions	State: - Chlorophyll a concentration in high-risk areas below the boundary limit between GES and non-GES classes of the assessment scales. - Decreasing trend in Chl-a concentrations in high-risk areas affected by human activities. - Index of turbidity below the boundary limit between GES and non-GES classes of the assessment scales to be set upon defining the turbidity assessment criteria¹. - Increasing trend of transparency in areas impacted by human activities². - Dissolved oxygen concentrations in high-risk areas below the boundary limit between GES and non-GES classes of the assessment scales to be set upon defining the oxygen concentrations assessment criteria³. - Increasing trend in dissolved oxygen concentrations in areas impacted by human activities⁴.

¹ Transferred from Indicator 5.2.2, Decision IG. 21/3, Annex I² ibidem³ Transferred from Indicator 5.3.1, Decision IG. 21/3, Annex I⁴ ibidem

Ecological Objective 9 (EO9): Contaminants cause no significant impact on coastal and marine ecosystems and human health			
Operational Objective	Indicator	GES	Revised Targets
9.1 Concentration of priority contaminants is kept within acceptable limits and does not increase	9.1.1 Concentration of key harmful contaminants measured in the relevant matrix (IMAP Common Indicator 17)	Level of pollution is below a determined threshold defined for the area and species.	State: - Concentrations of specific contaminants below either the boundary limit between GES and non-GES classes of the assessment scales or below reference concentrations (from other sources). - No increasing trends in contaminants concentrations in sediment and biota from human impacted areas, statistically defined. Pressure: - Reduction of contaminants emissions from land-based sources.
9.2 Effects of released contaminants are minimized	9.2.1 Level of pollution effects of key contaminants where a cause-and-effect relationship has been established (Common Indicator 18)	Concentrations of contaminants are not giving rise to negative effects on health status of marine biota	State: - Contaminants effects below thresholds. Pressure: - Decreasing trend in the operational releases of oil and other contaminants from coastal, maritime and offshore activities
9.3 Acute pollution events are prevented, and their impacts are minimized	9.3.1 Occurrence, origin (where possible), and extent of acute pollution events (e.g. slicks from oil, oil products and hazardous substances) and their impact on biota affected by this pollution (Common Indicator 19)	Occurrence of acute pollution events are reduced to the minimum.	Pressure: Decreasing trend in the occurrences of acute pollution events. Achieve the elimination of intentional pollution of the marine environment by oil and other harmful and noxious substances (HNS) and the minimization of accidental discharge of such substances.
9.4 Levels of known harmful contaminants in major types of seafood do not exceed established standards.	9.4.1 Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood (Common Indicator 20)	Concentrations of contaminants are within the regulatory limits for consumption by humans.	State: - Concentrations of contaminants in foodstuffs are below the UNEP/MAP Environmental Assessment Criteria approved for the protection of human health, . - Decreasing trend in the frequency of cases of seafood samples above the approved UNEP/MAP Environmental Assessment Criteria
9.5 Water quality in bathing waters and other recreational areas does not undermine human health	9.5.1 Percentage of intestinal enterococci concentration measurements within established standards (IMAP Common Indicator 21)	Concentrations of intestinal enterococci are within established standards	Increasing trend in the percentage of intestinal enterococci concentration measurements that fall in the approved GES categories as established in Decision IG.20/9 and the EU 2006/7 Directive.

Table 2: Operational Objectives, IMAP Candidate Common Indicators 26 and 27, GES Definitions and Revised Targets for Ecological Objective 11.

Ecological Objective 11 (EO 11): Noise from human activities causes no significant impact on marine and coastal ecosystems			
Operational Objective	Indicator	GES	Targets
11.1 Energy inputs into the marine, environment, especially noise from, human activities, are minimized ⁵	11.1.1. Proportion of days and geographical distribution where loud, low, and mid-frequency impulsive sounds exceed levels that are likely to entail significant impact on marine animal (Candidate Common Indicator 26) ⁶	Noise from human activities causes no significant impact on marine and coastal ecosystems	State: The extent (%) of habitat of noise-sensitive species within the assessment area that is impacted by impulsive noise events for a limited amount of time is below thresholds.
11.2. Energy inputs into the marine, environment, especially noise from, human activities, are minimized	11.2.1. Levels of continuous low frequency sounds with the use of models as appropriate (Candidate Common Indicator 27) ⁷	Noise from human activities causes no significant impact on marine and coastal ecosystems	State: The extent (%) of the assessment area which is above levels causing disturbance to sensitive marine animal is below limits, or such limits are exceeded for a limited amount of time.

⁵ Decision IG.20/4, Annex II

⁶ Decision IG.20/4, Annex II; IG.22/7

⁷ ibidem

Table 3: Operational Objectives, Indicators, GES Definitions and Targets for IMAP EO10.

Ecological Objective 10 (EO10): Marine and coastal litter do not adversely affect coastal and marine environment			
Operational Objective	Indicator	GES	Proposed Targets
10.1 The impacts related to properties and quantities of marine litter in the marine and coastal environment are minimized	10.1.1 Trends in the amount of litter washed ashore and/or deposited on coastlines (including analysis of its composition, spatial distribution and, where possible, source) (Common Indicator 22)	Number/amount of marine litter items on the coastline do not have negative impacts on human health, marine life and ecosystem services	Decreasing trend in the number of/amount of marine litter (items) deposited on the coast
	10.1.2 Trends in amounts of litter in the water column, including micro- plastics, and on the seafloor (Common Indicator 23)	Number/amount of marine litter items in the water surface and the seafloor do not have negative impacts on human health, marine life, ecosystem services and do not create risk to navigation	Decreasing trend in the number/amount of marine litter items in the water surface and the seafloor
	10.1.3 Trends in the amount of litter coming from riverine sources (Common Indicator 28)	Number/amount of litter items on riverbanks and water surface in estuaries do not have negative impacts on human health, marine life, ecosystem services and do not create risk to navigation	Decreasing trend in the number/amount of litter items deposited on riverbanks and in water surface in estuaries
10.2 Impacts of litter on marine life are controlled to the maximum extent practicable	10.2.1 Trends in the amount of litter ingested by marine organisms and in the number of individuals entangled in marine litter (Common Indicator 24)	Amount (g) of marine litter ingested by marine organisms do not alter populations of sentinel organisms Number of individuals entangled in marine litter do not alter populations of sentinel organisms	- Decreasing trend in the stomach content of the sentinel species. - Decreasing frequency of occurrence of sea turtles entangled in marine litter.

Appendix 2

Terms of reference (TORs) for Ecosystem Approach Correspondence Groups on Monitoring (CORMONs), and Online Working Groups (OWGs)

4. Terms of reference (TORs) for Ecosystem Approach Correspondence Groups on Monitoring (CORMONs), and Online Working Groups (OWGs)

4.1 Background and rationale

1. Since COP15 (Almeria, Spain, 15-18 January 2008, Decision IG.17/6), Contracting Parties decided to progressively apply the Ecosystem Approach to the management of human activities that may affect the Mediterranean marine and coastal environment for the promotion of sustainable development, with the overall objective of achieving the Good Environmental Status (GES) of the Mediterranean Sea and Coasts. COP15 also set out the governance of the Mediterranean Action Plan Barcelona Convention system, its goals and principles, and the mandates for the CU and the MAP Components (Decision IG.17/5).

2. COP17 (Paris, France, 8-10 February 2012) established the EcAp Coordination Group and adopted 11 Ecological Objectives (EOs) with a suite of associated Operational Objectives and indicators (Decision IG.20/4). The EcAp Coordination Group consists of MAP Focal Points, as per Decision IG.21/3, and its Terms of Reference were agreed by the Bureau (BUR/75/5, July 2012).

3. At their COP19 (Athens, Greece, 9-12 February 2016), the Contracting Parties to the Barcelona Convention adopted the Integrated Monitoring and Assessment Programme and related Assessment Criteria (IMAP), (Decision IG.22/7).

4. COP22 Antalya, Türkiye, December 2021 endorsed an updated governance mechanism for the implementation of the ecosystem approach in the Mediterranean in the framework of UNEP/MAP Barcelona Convention (Decision IG.25/03). Contracting Parties agreed to “Renew their commitment to the implementation of the Ecosystem Approach and endorse the Governance Mechanism for the Implementation of the Ecosystem Approach policy in the Mediterranean, set out in Annex I to this Decision”. The Decision, in its Annex I, states, “every effort to be made by the Secretariat to streamline and ensure the technical documents are cleared by the respective CORMON and MAP Component/Thematic Focal Points in line with their mandates, as appropriate, before they are submitted to the decision-making bodies”.

5. Moreover, COP 23 (Portoroz, Slovenia, 5-8 December 2023), took note of the Terms of Reference for the COMRONs, CORESA and Online Working Groups and the flow of interaction between Ecosystem Approach and MAP governing bodies (Annex IV of Decision IG.26/3).

6. The Secretariat submitted this document to the 11th Meeting of the Ecosystem Approach Coordination Group (EcAp CG) with aim to: (a) upgrade the ToRs for Correspondence Groups CORMONS and COR ESA and online Working Groups (OWGs) to align with COP22 Decision; and (b) to clarify the flow of work between Correspondence Groups and other decision-making bodies of the MAP system as well as providing clarity on the relationship between MAP Components and the Coordinating Unit for EcAp related products.

7. Further to that document, MED POL prepared a version to the Joint Meeting of the Ecosystem Approach Correspondence Groups on Pollution and Marine Litter Monitoring (Anavyssos, Greece, 27 -28 May 2025), excluding the information and content relevant to CORESA.

8. In line with the consultation process initiated with the Contracting Parties after the 11th EcAp CG Meeting, the final scope is to include this section (i.e., section 4 of the present document) as a stand-alone annex into the under-preparation draft COP Decision for upgrading the Ecosystem Approach (EcAp) Policy and Roadmap in the Mediterranean.

4.2 Ecosystem Approach Correspondence Groups on Monitoring (CORMONs)

4.2.1 Composition

9. The Correspondence Groups on monitoring (CORMONs) are established for each thematic cluster – Biodiversity and Fisheries; Pollution and Marine Litter; and Coast and Hydrography.

10. CORMONs are composed of national experts designated by the Contracting Parties possessing the necessary expertise and experience in line with the mandates of respective CORMON for IMAP implementation. They can be designated by the MAP Focal Points/EcAp CG members or by the thematic/MAP Components' Focal Points, preferably in consultation with each other.

4.2.2 Operation

11. The CORMONs' work is supported by the respective MAP Component: MED POL for Pollution and Marine Litter; PAP/RAC for Coast and Hydrography; and SPA/RAC for Biodiversity and Fisheries. Technical and scientifically related tasks may be supported by external experts, during preparation of the documents for consideration of respective CORMONs. The overall coordination of the work of CORMONs remains with the Coordinating Unit and is carried out in accordance with MAP Programme of Work (POW) priorities and implementation of the EcAp Roadmap and Policy.

12. CORMONs may meet physically or by teleconference, depending on the agenda, the volume of work and documents to be considered. Provisions for CORMON meetings numbers, main deliverables and modality are made in the MAP POW.

4.2.3 CORMON Mandates

13. CORMONs have the primary role to guide and deliver the implementation of technical and scientific aspects of IMAP and delivery of QSR with support from the Secretariat and MAP Components and foster regional and sub-regional collaboration and exchange of best practices and know-how with regards to monitoring and assessment of marine and coastal environment.

14. The operation of the CORMONs should recognize that the implementation of the ecosystem approach is comprehensive in terms of the multidisciplinary and scientific context of the documents that need to be discussed, and therefore iterative in terms of coordination of the results of work within the UNEP/MAP-Barcelona Convention system and at Contracting Party level.

15. Generally, CORMONs are assigned with the preparation and negotiation of the following main types of IMAP products:

- Monitoring guidelines and protocols on, sampling; sample processing analysis/determination; quality assurance (QA); and reporting
- IMAP indicator guidance factsheets
- Areas/scales of assessment, assessment criteria, and guidance for their application
- Assessment methodologies, assessment products and QSR (structure/contents, conclusions)
- Data standards (DS) and data dictionaries (DD)
- Data management QA and QC
- Updates of IMAP & progress reporting on IMAP implementation
- Implementation of national IMAPs
- Proficiency testing
- Capacity building activities
- IMAP related Project outcomes

16. CORMON IMAP products are of a technical and scientific nature, they may impose policy and financial impacts on IMAP implementation. A detailed elaboration of the different levels of responsibilities for consideration and approval of different types of IMAP products is provided in Annex I.

17. Online Working Groups (OWG) may be established by CORMONs in order to provide specific scientific inputs: OWGs are composed of a restricted number of experts and scientists nominated by the Contracting Parties. In their delivery OWGs may be supported by experts mobilized by the Secretariat and MAP Components in accordance with provisions of the approved MAP POW and budget or related projects as appropriate. The tasks and outcome of the work of OWG are defined by the CORMONs. OWGs report to CORMONs. To this aim the chair of the OWG in consultation with the Secretariat/MAP Components presents the outcome of the OWG to CORMON.

18. The OWG do not replace the formal Correspondence Groups.

19. Every effort should be made to maintain geographical balance in the composition of the OWG and mobilize high level expertise.

20. No language interpretation is provided by the Secretariat at the OWG, nor are official meeting documents formally disseminated. Members of the OWG are strongly encouraged to provide scientific and technical inputs and support to the Secretariat/MAP Component work with regards to IMAP implementation and delivery of its products.

4.3 Effective interaction among different MAP bodies

21. The level of interaction between the bodies of the EcAp governance structure and MAP decision making bodies i.e., MAP Components/Thematic Focal Points, MAP Focal Points and COP depends on the nature of the products as detailed in Annex 1, in line with their respective mandates. Annex I also provide information on the type of documents to be reviewed by each body.

22. In line with mandate of MED POL Focal Points, the present MED POL Focal Points Meeting should review only the sections related to the CORMON and Components/Thematic Focal Points Meetings, including the first two columns of Annex I.

Annex I

Possible products and interaction between EcAp governance bodies

Annex I: Possible products and interaction between EcAp governance bodies

Note: The present MED POL Focal Points Meeting should review only the first and second columns of Annex I.

CORMONs	Component/ Thematic Focal Points (FP)	EcAp Coordination Group (CG)	MAP Focal Points (FP) / COP
1. Monitoring guidelines/ protocols			
Products of a complex scientific and technical nature that may have financial implications for implementation of IMAP.	MAP Components report on progress to their Focal Points. Focal Points review proposed activities for their inclusion in the programme of Work (POW).	Coordinating Unit (CU) reports to EcAp CG on progress based on reports of MAP Components.	CU reports on progress and related activities of POW and Budget.
2. IMAP indicator guidance factsheets			
Products of a complex scientific and technical nature that may have policy and financial implications.	MAP Components report on progress to their Focal Points. Focal Points review proposed activities for their inclusion in POW. Recommended by CORMONs for no objection procedure.	CU reports to EcAp CG on progress based on reports of MAP Components. Based on current practice, endorsement by EcAp CG.	Approval of the respective provisions in the POW & budget, as appropriate.
3. Data dictionaries and data standards (DDs and DSs)			
Products of a technical nature.	MAP Components report on progress to their Focal Points. Focal Points review proposed activities for their inclusion in POW. Recommended by CORMONs for no objection for their submission to EcAp CG meeting and approval of the related provisions in the POW.	CU reports to EcAp CG on progress based on reports of MAP Components. Based on current practice, endorsement by EcAp CG, for MAP FP.	Approval of the respective provisions in the POW & budget, as appropriate.
4. Assessment criteria			
Products of a complex scientific and technical nature that may have policy implications, including allocation of financial resources for implementation of IMAP.	MAP Components report on progress to their Focal Points. Focal Points review proposed activities for their inclusion in POW. Review and endorsement for submission to EcAp CG meeting.	CU reports to EcAp CG on progress based on reports of MAP Components. Review and endorsement for submission to MAP FP.	Review and approval for submission to COP. COP Decision
5. Assessment methods & products, QSR structure, contents & conclusions			

Scientific products with recommendations for COP consideration.	MAP Components report on progress to their Focal Points. Focal Points review proposed activities for their inclusion in POW. No objection from the scientific point of view; endorsement of recommendations. Recommendation for transmission to EcAp CG meeting.	CU reports to EcAp CG on progress based on reports of MAP Components. Endorsement of key findings and recommendations for submission to MAP Focal Points.	General review of main findings and recommendations and approval for submission to COP. In depth review of the related draft Decision body for submission to the COP. COP Decision.
6. Thematic assessments			
Thematic assessments prepared and approved.	MAP Components report on progress to their Focal Points. Focal Points review proposed activities for their inclusion in POW. Overall discussion and feedback on assessment recommendations. Endorsement for publication.	CU report on the progress; review of recommendations as appropriate. Endorsement of key findings and recommendations for submission to MAP Focal Points as appropriate.	Review of potential activities included in the POW. Review and endorse as appropriate of the key findings and recommendations.
7. IMAP development and update			
Scientific and policy products.	MAP Components report on progress to their Focal Points. Focal Points review proposed activities for their inclusion in POW. Review and approval for transmission to EcAp CG meeting.	CU reports to EcAp CG on progress based on reports of MAP Components Review and endorsement for submission to MAP FP	Responsible for approving all updates of IMAP implementation and approving the financial resources to address the needs as proposed by the respective CORMON and Component FPs. Review and approval for submission to COP, COP Decision

8. Implementation of National IMAPs			
National IMAPs are of a technical nature with the implications for financial and policy aspects. The respective CORMON should be responsible for providing the recommendations in relation to: (i) the effectiveness of implementation of the National IMAPs related to the relevant IMAP Cluster; (ii) the gaps identified in the process of the National IMAPs implementation; (iii) the needs to be addressed, including technical, human resources, governance and financial aspects; (iv) harmonization of National IMAPs implementation; and (v) mechanisms/sources/means that could provide solutions and be used to improve implementation of National IMAPs.	MAP Components report on progress to their Focal Points. Focal Points review proposed activities for their inclusion in POW. Report on the progress, POW provisions as appropriate.	CU reports to EcAp CG on progress based on reports of MAP Components.	CU reports on progress and related activities of POW and Budget as appropriate.
9. Proficiency Testing			
Proficiency Testing (PT) is of a technical nature, based on the complex scientifically related procedures; however, with certain implications for policy decision-makers.	MAP Components report on progress to their Focal Points. Focal Points review proposed activities for their inclusion in POW Review of the outcome of Proficiency testing and delivery of recommendations to Focal Points; consideration of their outcome in the design of the POW as appropriate.	CU reports to EcAp CG on progress based on reports of MAP Components.	CU reports on progress and related activities of POW and Budget as appropriate.
10. Capacity Building Activities			
Products of a technical character.	MAP Components report on progress to their Focal Points. Focal Points review proposed activities by CORMONs for their inclusion in POW.	CU Report on the progress.	CU reports on progress and related activities of POW and Budget.
11. Data management/QA/QC			
Products of a technical nature.	MAP Components report on progress to their Focal Points. Focal Points review proposed activities for their inclusion in POW as appropriate.	CU reports to EcAp CG on progress based on reports of MAP Components.	CU reports on progress and related activities of POW and Budget as appropriate.

COR ESA	Component/ Thematic Focal Points	EcAp Coordination Group	MAP Focal Points / COP
Review of relevant assessments/studies			
COR ESA is responsible for reviewing analyses and assessments carried out for EcAp that are of relevance for social and economic considerations. In particular:	Report on the progress	Report on the progress	Report on the progress
Socio-economic assessments.	MAP Components report on progress to their Focal Points Focal Points review proposed activities for their inclusion in POW.	CU reports to EcAp CG on progress based on reports of MAP Components. Endorsement of assessment by the EcAp CG. Possible recommendations to MAP FP meeting.	CU reports on progress and related activities of POW and Budget. Approval of assessment.
Socio-economic chapter of the Mediterranean Quality Status Report (QSR).	MAP Components report on progress to their Focal Points Focal Points review proposed activities for their inclusion in POW. No objection from the scientific point of view.	CU reports to EcAp CG on progress based on reports of MAP Components. Review and Endorsement of the chapter.	Overall endorsement of the chapter as part of the relevant 2023 MED QSR endorsement COP Decision.
Analyses of the socio-economic aspects of national programmes of measures.	MAP Components report on progress to their Focal Points Focal Points review proposed activities for their inclusion in POW.	CU reports to EcAp CG on progress based on reports of MAP Components. Endorsement of analyses, possible recommendations to MAP FP.	Report on the progress. Submission of COR ESA recommendations by the EcAp CG to MAP Focal Points/COP as relevant.
Provide guidelines to support Contracting Parties to undertake socio-economic analyses at the national level.	MAP Components report on progress to their Focal Points Focal Points review proposed activities for their inclusion in POW. Review and Endorsement and recommend submission to EcAp CG.	CU reports to EcAp CG on progress based on reports of MAP Components. Review and endorsement.	Report on the progress.
Methodological tools with regard to socio-economic assessments	MAP Components report on progress to their Focal Points Focal Points review proposed activities for their inclusion in POW. Review and Endorsement and recommend submission to EcAp CG	CU reports to EcAp CG on progress based on reports of MAP Components. Review and endorsement.	Report on the progress

Appendix 3

**Revised Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and
Related Assessment Criteria for Pollution and Marine Litter (EO5, EO9, EO10, EO11)**

Monitoring and assessment of pollution and marine litter related common indicators

Eutrophication (EO5):

1. Eutrophication is a process driven by enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, leading to increased growth, primary production and biomass of algae; changes in the balance of nutrients causing changes to the balance of organisms; and water quality degradation.

2. Eutrophication related Common Indicators:

Common Indicator 13: Concentration of key nutrients in water column (EO5);

Common Indicator 14: Chlorophyll-a concentration in water column (EO5).

3. The monitoring of eutrophication under IMAP builds on the monitoring system of UNEP/MAP MED POL Monitoring programme. The Contracting Parties have IMAP-based monitoring programmes in place for eutrophication all over the Mediterranean basin.

4. The Contracting Parties, building on their national monitoring programmes, the lessons learned during the initial phase of implementing the Integrated Monitoring and Assessment Programme and previous MED POL experience with eutrophication, update their IMAP-based national monitoring programmes. The overall aim is to enhance harmony and coherence among the national monitoring programmes and to establish coherent datasets at the entire regional sea level.

5. The methodologies, monitoring protocols and quality control and quality assurance measures are available for the Contracting Parties in line with the Indicators' Guidance Factsheets.

6. The geographical scale of monitoring for the assessment of GES for eutrophication depends on the hydrological and morphological conditions of an area, particularly the freshwater inputs from rivers, salinity, general circulation, upwelling, and stratification.

7. The spatial distribution of the monitoring stations should thus, prior to the establishment of the eutrophication status of the marine sub-region/area, be risk-based and proportionate to the anticipated extent of eutrophication in the sub-region under consideration, as well as its hydrographic characteristics aiming for the determination of spatially homogeneous areas. Consequently, each Contracting Party determines the optimal spatial distribution of monitoring stations.

8. The Contracting Parties should use reference conditions and boundary values for chlorophyll-a (Chl-a) and nutrients, as outlined in Annex I, developed and region-wide approved for major coastal water types in the Mediterranean, including their application in the GES/non-GES /environmental classifications. To this aim, further work is required to expand and upgrade the reference conditions and boundary values for the four Mediterranean sub-regions, ensuring optimal GES assessment.

9. The Contracting Parties should use the-assessment methodologies as described in the Indicators' Guidance Factsheets for eutrophication.

10. Work should be undertaken to upgrade GES reference conditions and boundary values for Chl-a, nutrients, transparency, and oxygen, using an adequate geographical scale, as well as to harmoniz existing assessment tools.

11. Work should continue to further develop the assessment scales based on the monitoring scales, aiming for optimal integration of monitoring and assessment areas among the Ecological Objectives of IMAP.

12. The Contracting Parties should ensure that adequate interlaboratory quality assurance and quality control (QA/QC) procedures are established for IMAP-competent laboratories concerning Common Indicators 13 and 14, and to this aim intercalibration testing should be conducted, and the IMAP Info System should integrate data quality control categories. These efforts should be supported through greater harmonization of diverse data management systems at the international level.

13. The Contracting Parties should exchange experiences and strengthen their capacities in monitoring and conducting GES assessments at the national level, while also contributing to sub-regional and regional efforts for Common Indicators 13 and 14, based on the approved monitoring standards, assessment tools, and criteria within the framework of IMAP implementation.

Contaminants (EO9):

14. The monitoring of chemical contaminants in water, sediments and biota under IMAP builds on the monitoring system with a long-standing history in the Mediterranean, under the auspices of the UNEP/MAP Barcelona Convention, its Land-Based Protocol, and UNEP/MAP MED POL monitoring programme.

Contaminants related Common Indicators:

- | | |
|----------------------|--|
| Common Indicator 17: | Concentration of key harmful contaminants measured in the relevant matrix (EO9, related to biota, sediment, seawater); |
| Common Indicator 18: | Level of pollution effects of key contaminants where a cause-and-effect relationship has been established (EO9); |
| Common Indicator 19: | Occurrence, origin (where possible), extent of acute pollution events (e.g. slicks from oil, oil products and hazardous substances), and their impact on biota affected by this pollution (EO9); |
| Common Indicator 20: | Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood (EO9); |
| Common Indicator 21: | Percentage of intestinal enterococci concentration measurements within established standards (EO9). |

15. All Mediterranean countries, building on their national monitoring programmes, the lessons learned during the initial phase of implementing the IMAP and previous MED POL experience with contaminants, update their IMAP-based national monitoring programmes for contaminants. The overall aim is to enhance harmony and coherence among the national monitoring programmes and to establish coherent datasets at the entire regional sea level.

16. Biological effects monitoring has been progressively integrated in the IMAP-based national monitoring programmes. It is essential to further expand and develop the use of biological effects methods, including the integration of chemical and biological effects monitoring and assessment, to cover properly the EO9.

17. In addition, it is important to further harmonize monitoring of contaminants in different matrices in order to optimize assessments at regional, sub-regional, and national levels, as well as to enhance assessment criteria and apply integrated chemical and biological assessment methods.

18. While monitoring stations are well defined in the IMAP-based national monitoring programmes, there is also a need for the Contracting Parties to strengthen monitoring in offshore areas.

19. The methodologies, monitoring protocols and, quality control and quality assurance measures, are available for the Contracting Parties in line with the Indicators' Guidance Factsheets.

20. Regarding acute pollution events, while the Contracting Parties already have existing monitoring obligations under Article 9 of the Prevention and Emergency Protocol, the efforts of which need to be strengthened, it is also foreseen that further analysis of the links between acute pollution events and effect on biota should be enhanced.

21. IMAP-based monitoring of contaminants in biota used for human consumption also builds on previous monitoring requirements and measures contaminants in foodstuffs for which the maximum regulatory limits have been set as outlined in Annex I.

22. Regarding the percentage of intestinal enterococci, threshold values are developed and region-wide agreed for the Mediterranean through Decision IG.20/9 on "Criteria and Standards for bathing waters quality in the framework of the implementation of Article 7 of the LBS Protocol" (COP 17, 2012)-to ensure GES assessment of bathing water quality.

23. The Contracting Parties should use the Background Criteria (BC), Background Assessment Criteria (BAC) and Environmental Assessment Criteria (EAC) values, as outlined in Annex I, developed and region-wide approved for IMAP Common Indicators 17, 18 and 20 in the Mediterranean, including their application in the GES/non-GES /environmental classifications. To this aim, further work is required to regularly upgrade BC and BAC values, and to develop or upgrade the EAC values for IMAP Common Indicators 17, 18, and 20 by using data relevant to the specific ecological characteristics of the four Mediterranean sub-regions, ensuring optimal GES assessment.

24. The Contracting Parties should use the assessment methodologies as described in the Indicators' Guidance Factsheets for Ecological Objective 9.

25. Work should continue in developing the assessment scales based on the monitoring scales, aiming for optimal integration of monitoring and assessment areas among the Ecological Objectives of IMAP.

26. The Contracting Parties should ensure that adequate interlaboratory quality assurance and quality control (QA/QC) procedures are enhanced for IMAP-competent laboratories concerning Common Indicators 17, 18 and 20, and to this aim intercalibration testing should be conducted, and the IMAP Info System should integrate data quality control categories.

27. The Contracting Parties should exchange experiences and strengthen their capacities in monitoring and conducting GES assessments at the national level, while also contributing to sub-regional and regional efforts for Common Indicators 17, 18, 19, 20 and 21, based on the approved monitoring standards, assessment tools and criteria within the framework of IMAP implementation.

Marine litter (EO10):

29. Marine litter monitoring ~~of IMAP is based~~ **builds on the monitoring requirements of the** Regional Plan on Marine Litter Management in the Mediterranean (Decision IG. ~~20/10, the MLRP25/9,~~ **COP 22**), on the UNEP Guidelines for Comprehensive Beach Litter Assessment and on the Guidance on Monitoring of Marine Litter in Seas surrounding Europe and on the following agreed common ~~and~~ **candidate** indicators:

Common Indicator 22: Trends in the amount of litter washed ashore and/or deposited on coastlines (EO10);

Common Indicator 23: Trends in the amount of litter in the water column including microplastics and on the seafloor (EO10);

Common Indicator 24: Trends in the amount of litter ingested by marine organisms and in the number of individuals entangled in marine litter (EO10).

Common Indicator 28: Trends in the amount of litter coming from riverine sources (EO10)

30. **All** Contracting Parties **have established since 2016 national IMAP-based monitoring programmes in relation to Common Indicators 22 and 23 (in particular on beach macro-litter, seafloor macro-litter, and floating microplastics). The Contracting Parties should include in their monitoring programmes Common Indicator 24 related to ingestion and entanglement of marine litter from sea turtles and to undertake pilot monitoring activities on the latter.**

31. **The methodologies, monitoring protocols and quality control and quality assurance measures are available for the Contracting Parties in line with the Indicators' Guidance Factsheets.**

32. **The Contracting Parties should use the agreed Baseline Values (BV) and Threshold Values (TV¹) for Common Indicators 22, 23 and 24 of IMAP EO10 as presented in Annex I – Part II. GES/nonGES assessment classification scales builds on the Threshold Values.**

33. **The Contracting Parties should encourage** citizens, communities (NGOs, civil society initiatives), and environmental protection associations and institutes across the **Mediterranean to take** part in activities **related** to marine litter **monitoring**.

34. Regarding beach **macro-litter (Common Indicator 22)**, cost-efficient and easy to follow monitoring and sampling methodologies and techniques are well established, as described in the **Indicator Guidance Factsheets**, with at least two surveys per year in spring and autumn recommended and ideally 4 surveys per year in spring, summer, autumn and winter.

35. **The Contracting Parties should establish their national monitoring programs for IMAP EO10 based on a master list of litter categories and items is as presented in the respective Integrated Monitoring-Indicator Guidance Factsheets. Further work is needed to update within IMAP EO10 for beach macro-litter, the minimum size of recorded marine litter items which need to be considered as of 2.5cm.**

36. Regarding monitoring **of marine** litter at the sea (Common Indicator **23**), due to the low occurrence of litter in midwater, the common indicator focuses on **surface floating** and seafloor litter, **including microplastics**. Due to the observation methodology (observation from ships), the type of marine **macro-litter** objects can only be noted during very short visual observation. Therefore, in contrast to beach litter, only rough litter categories can be determined, even though monitoring size categories should also include relevant small items, in line with the Integrated Monitoring and Assessment Guidance.

¹ Threshold Values are subject to update for the third iteration of the MED QSR.

37. The Contracting Parties are encouraged to apply the approved regional Guidelines detailing the monitoring of floating microplastics.

38. Monitoring of seafloor macro-litter (Common Indicator 23), focuses on opportunistic monitoring which is a cost-efficient method, being jointly implemented with national/regional fish-stock assessment survey programmes (e.g., the Mediterranean International Bottom Trawl Surveys (MEDITS)), including the use of scuba divers and compatible professional trawling operations. Upcoming technologies based on observation/imaging (e.g., ROVs, diver-based recording etc.) may be considered and conducted also as part of other surveys (e.g., within the programmes on biodiversity, with methodologies and technical requirements prescribed in the Indicator Guidance Factsheets.

39. Riverine litter is considered as part of IMAP EO10. The Contracting Parties should/are encouraged to apply the approved region-wide Guidelines for Monitoring Riverine inputs of Marine Litter.

40. It is important to note that while micro-litter and in particular microplastics are considered in IMAP-EO10, further work is still necessary at regional level, recognizing that the understanding of the potential impact on organisms and in the environment is still under development. Contracting Parties are encouraged also to undertake pilots monitoring, further research and work in this area (e.g., microplastics and mesoplastic on beaches, microplastics on sediment, pellets on beaches etc.).

41. The Contracting Parties should monitor the ingestion and entanglement of marine litter from biota, in particular from sea turtles (Common Indicator 24) considering that the most representative species are identified; in line with the approved and available region-wide monitoring protocols addressing ingestion and entanglement; They are encouraged to consider taking into account the Regional Operational Strategy and apply the approved Baseline Values (BV) and Threshold Values (TV) (Annex I – Part II).

42. In designing, upgrading their national monitoring programme, and undertaking the respective assessment for EO10, the Contracting parties are encouraged to use the Indicators' Guidance Factsheets that detail technical specifications on assessment methodologies and scales.

Energy including Underwater Noise (EO11):

43. EO 11 is introduced in IMAP with the support of experts of the Joint ACCOBAMS/ ASCOBANS/ CMS Working Group on Noise.

44. The two Candidate Common Indicators related to energy including underwater noise are:

Candidate Common Indicator 26: Proportion of days and geographical distribution where loud, low, and mid-frequency impulsive sounds exceed levels that are likely to entail significant impact on marine animals;

Candidate Common Indicator 27: Levels of continuous low frequency sounds with the use of models as appropriate.

45. Candidate Common Indicators 26 and 27 are more closely related to the acoustic biology of key marine mammal species of the Mediterranean which are known to be sensitive to noise, i.e., the fin whale, the sperm whale and the Cuvier's beaked whale. The monitoring strategy of these two candidate indicators, is set in the Indicators' Guidance Factsheets, ensuring an effective and widely agreed monitoring of underwater noise at a regional scale.

46. In line with the above, the Contracting Parties should consider including these two Candidate Common Indicators in their IMAP-based national monitoring programmes.

47. Work should continue by developing monitoring and assessment methodologies along with Threshold Values and GES/non-GES boundary values applied for continuous and impulsive noise.

48. For GES assessment related to EO11, the Contracting Parties should use the approved threshold levels and applied to the percentage of habitat occupied by noise-sensitive species affected by impulsive noise events concerning Candidate Common Indicator 26, following a risk-based approach, and a single Threshold Value developed and applied to the percentage of habitat of noise-sensitive species affected by continuous noise concerning Candidate -Common Indicator 27.

49. Work should continue to improve the quality and availability of underwater noise data, as well as monitoring and assessment practices.

Annex I

IMAP Assessment Criteria for Nutrients, Contaminants and Marine Litter²

² The Assessment Criteria for Nutrients, Contaminants and Marine Litter have been approved by COP23 ([Decision IG.23/3, Annex II](#)), with the exception for Common Indicator 24.

Annex I: IMAP Assessment Criteria for Nutrients, Contaminants and Marine Litter**PART I: Pollution (IMAP EO5 and EO9)****1. The assessment criteria for Common Indicators 13 and 14³****Table 1.** Major coastal water types in the Mediterranean

	Type I	Type II-A, II-A Adriatic	Type III-W	Type III-E	Type Island-W
σ_t (density)	<25	25< σ_t <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, the classification scheme on Chl *a* concentration (in $\mu\text{g/l}$) is optimal 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 major coastal water types are 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 2. 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-region⁴.

(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).

Water Typology	Coastal waters					
	Reference conditions of <i>c</i> (Chl <i>a</i>) ($\mu\text{g/L}$)		Boundaries of <i>c</i> (Chl <i>a</i>) ($\mu\text{g/L}$) for G/M status		Reference conditions of <i>c</i> (TP) ($\mu\text{mol/L}$)	Boundaries of <i>c</i> (TP) ($\mu\text{mol/L}$) for G/M status
	<i>G_mean</i>	90% percentile	<i>G_mean</i>	90% percentile		
Type I	1.19	3.33 ^b	4.1	10		
Type I Adriatic	1.40	3.94	5.0 ^a	14.1	0.19 ^a	0.55 ^a
Type II-A-FR-SP ^d	0.78 ⁵	1.9	1.48	3.50 ⁶	-	-
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	-	-

³ For ease of reference, the Secretariat included the values as approved by Decisions IG.22/7 (COP 19) and IG. 23/6 (COP 20) which are shown in shaded cells.

⁴ The new values are calculated based on data as available by December 2022.

⁵ *Gmean* values corresponding to the reference and boundary values of Chl*a* (expressed as the 90th percentile) are provided for Type II A FR SP and Type III W FR SP, along with the corrected calculation of *Gmean* value for Type I, compared to those included in Decisions IG.22/7 and IG.26/3, shown in blue shaded cells.

⁶ The value of 3.58 $\mu\text{g/L}$ is corrected to 3.50 $\mu\text{g/L}$ for Type II A FR SP in comparison to the values provided in Decision IG.22/7 on Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria (COP 19, 2016) and Decision IG.26/3 on 2023 MED QSR and a Renewed Ecosystem Approach Policy in the Mediterranean (COP 23, 2023), following the identification of an error by the Joint Meeting of CorMon on Pollution and Marine Litter Monitoring held on 27–28 May 2025 in relation to the boundary values used in the 2023 MED QSR.

Type III-W-FR-SP	0.37 ^f	0.9	0.74 ^f	1.89 ⁷	-	-
Type III-E		0.1		0.4		
Type Island-W		0.6		1.2-1.22		
Water Typology	Open (offshore) waters in the Adriatic Sea Sub-region					
	Reference conditions of <i>c</i> (Chl <i>a</i>) (µg/L)		Boundaries of <i>c</i> (Chl <i>a</i>) (µg/L) for G/M status		Reference conditions of <i>c</i> (DIN) (µmol/L)	Boundaries of <i>c</i> (DIN) (µmol/L) for G/M status
	<i>G</i> _{mean}	90 % percentile	<i>G</i> _{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 Gulf 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 Chl*a* 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 Chl*a* 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 Chl*a* and DIN could not be proposed.

2. The assessment criteria for IMAP Common Indicator 17⁸⁹

2.1 The BC and BAC values for IMAP Common Indicator 17

Table 3. The BC and BAC values for trace metals in sediments. The units of concentration are given in µg/kg dry wt, as requested by IMAP.

The BC and BAC values for trace metals in sediments					
The BC values 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
The BAC values in sediments, (µg/kg dry wt)					

⁷ The value of 1.80 µg/L is corrected to 1.89 µg/L for type III W FR SP in comparison to the values provided in Decisions IG.22/7 and Decision IG.26/3, following the identification of an error by the Joint Meeting of CorMon on Pollution and Marine Litter Monitoring held on 27–28 May 2025 in relation to the boundary values used in the 2023 MED QSR.

⁸ For ease of reference, the Secretariat included the values as approved by Decisions IG.22/7 OF (COP 19) and IG.23/6 (COP 20) which are shown in shaded cells.

⁹ The new values are calculated based on data as available by December 2022.

	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 4. The BC and BAC values for Polycyclic Aromatic Hydrocarbons (PAHs) in sediments. The units of concentration are given in µg/kg dry wt, as requested by IMAP.

The BC and BAC values for Polycyclic Aromatic Hydrocarbons (PAHs) in sediments					
PAH compounds	The BC values in sediments, µg/kg dry wt				
	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
PAH compounds	The BAC values in sediments, µg/kg dry wt				
	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
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 5. The BC and BAC values for trace metals in mussel (*M. galloprovincialis*) and fish (*M. barbatus*) . The units of concentration are given as requested by IMAP.

The BC and BAC values for trace metals in mussel soft tissue (<i>M. galloprovincialis</i>), µg /kg dry wt					
The BC values					
TM	MED	WMS	ADR	CEN	AEL
Cd	710	1030	629	*	942 ^{>}
Hg	77.9	85.0	75.4	*	110 ^{>}
Pb	1100	1260	1000	*	2300 ^{>}
The BAC values					
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.

The BC and BAC values for trace metals in fish muscle (<i>Mullus barbatus</i>), µg/kg wet wt					
The BC values					
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
BAC values					
	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 6. The BC and BAC values for Polycyclic Aromatic Hydrocarbons (PAHs) in mussel (*M. galloprovincialis*). 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.

The BC and BAC values for Polycyclic Aromatic Hydrocarbons (PAHs) in mussel (<i>M. galloprovincialis</i>), µg/kg dry wt			
BC values			
	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 ¹⁰	5.80	5.60	6.60
The BAC values			
	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;

¹⁰ 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 7. The BAC values for organochlorinated contaminants (PCBs and pesticides) in sediments and mussel (*M. galloprovincialis*). The unit of concentrations 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.

The BAC values for organochlorinated contaminants (PCBs and pesticides) in sediments and mussel (<i>M. galloprovincialis</i>)					
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

2.2 The Environmental Assessment Criteria (EAC) values for IMAP CI 17

Table 8. The Mediterranean EAC values for trace metals in sediments and biota, as endorsed by Decision IG.23/6

The Mediterranean EAC values for trace metals in sediments and biota			
TM	MedEAC*	#MedEAC	#MedEAC
	Sediments, µg/kg dry wt	<i>M. galloprovincialis</i> , µg/kg dry wt	<i>Mullus barbatus</i> , 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

Table 9. The 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

The Mediterranean EAC values for Polycyclic Aromatic Hydrocarbons (PAHs) in sediments and biota				
	Sediments, µg/kg dw		Biota Mussels, µg/kg dw	
	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 [#]
PAH compounds				
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	

The 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 [#]
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 10. The 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.

The Mediterranean EAC values for for organochlorinated contaminants (PCBs and pesticides) in sediments and biota					
PCBs	Sediments			Mussel	Fish
	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
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.

3. The Environmental Assessment Criteria (EAC) related to IMAP Common Indicator 20

Table 11. The Mediterranean EACs values for CI 20 related to trace metals based on the maximum regulatory levels for trace metals in foodstuffs for the protection of human health, as provided in EC/EU Directives 1881/2006 and its amendments 488/2014 and 1005/2015. The concentrations are presented in mg/kg wet wt.

The EAC CI 20 for trace metals- EU 1881/2006 directive and its amendments 488/2014 and 1005/2015			
matrix	TM, mg/kg wet wt		
	Cd	Hg	Pb
fish muscle	0.05-0.25	0.5-1	0.3
cephalopods	1		1
crustaceans	0.5	0.5	0.5
bivalve mollusc	1		1.5

Table 12. The Mediterranean EAC values for IMAP CI 20 related to Benzo(a)pyrene and sum of four PAHs 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) 1881/2006. The concentrations are presented in µg/kg wet wt.

The EACs values for CI 20 related to Benzo(a)pyrene and sum of four PAHs (benzo(a)pyrene, benz(a)anthracene, benzo(b)fluoranthene and 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 13. The Mediterranean EAC values for CI 20 related to Dioxins and PCBs 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.

The 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.

4. The Environmental Assessment Criteria (EAC) values for IMAP CI 18¹¹

Table 14. The Mediterranean BACs and EACs for biomarkers in mussel (*M. galloprovincialis*) as endorsed by Decisions IG.22/7 and IG.23/6.

The Mediterranean BACs and EACs for biomarkers in mussel (<i>M. galloprovincialis</i>)				
Biomarkers/Bioassays and units	BACs IG.23/6 in Mussels (<i>Mytilus galloprovincialis</i>)	EACs IG.23/6 in Mussels (<i>Mytilus galloprovincialis</i>)	BACs IG.22/7 in Mussels (<i>Mytilus galloprovincialis</i>)	EACs IG.22/7 in Mussels (<i>Mytilus galloprovincialis</i>)
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			

^aTechnical 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)

¹¹ For ease of reference, the Secretariat included the values as approved by Decisions IG.22/7 of (COP 19) and IG.23/6 (COP 20) which are shown in shaded cells.

PART II: Marine Litter (IMAP – EO10)¹²**5. Baseline Values (BV) and Threshold Values (TV) for IMAP Common Indicator 22****Table 15:** Baseline Values and Threshold Values for IMAP Common Indicator 22 (i.e., beach macrolitter).

IMAP Indicator	Categories of Marine Litter	Baseline Values (BV – 2021)	Threshold Value (TV – 2021)
Common Indicator 22	Beach Macro-litter	369 items/100m	130 items/100m

6. Baseline Values (BV) and Threshold Values (TV) for IMAP Common Indicator 23**Table 16:** Baseline Values and Threshold Values for IMAP Common Indicator 23 (i.e., seafloor macrolitter, floating microplastic).

IMAP Indicator	Categories of Marine Litter	Baseline Values (BV – 2023)	Threshold Value (TV – 2023)
Common Indicator 23	Seafloor Macro-litter	135 items/km ²	38 items/km ²
Common Indicator 23	Floating Microplastics	0.044338 items/m ²	0.000845 items/m ²

7. Baseline Values (BV) and Threshold Values (TV) for IMAP Common Indicator 24¹³**Table 17:** Updated Baseline Values (BV) and Threshold Values (TV) for IMAP Common Indicator 24 (i.e., for ingestion and entanglement on *Caretta caretta*).

IMAP Common Indicator 24	Updated BV (2025)	Proposed TV (2025)
Common Indicator 24: Ingestion	0.07 gr dry weight ML ingested ¹⁴	0.01 gr dry weight ML ingested
Common Indicator 24: Entanglement	35% affected sample	9% affected sample

¹² Threshold Values are subject to update for the third iteration of the MED QSR.¹³ Values for ingestion and entanglement were revised further to the review of the Joint Meeting of the Ecosystem Approach Correspondence Groups on Pollution and Marine Litter Monitoring (Anavyssos, Greece, 27 -28 May 2025). The detailed elaboration and applied methodology with regards to the updated values is provided in WG.627/Inf.10.

8. Updated Environmental Targets for Marine Litter

Table 18. Intermediate (IET) and Final (FET) Environmental Targets for IMAP EO10 Marine Litter Common Indicators.

IMAP Common Indicator (CI)	Marine Litter Categories	Threshold Value	ML Average Concentrations*	IET 2026	IET 2028	IET 2030	FET		
							Value	by:	RP**
CI22 (item/100m)	Beach Macrolitter	130	6,425±9,075	150	-	-	130	Approx. 2027	65%
CI23 (item/km ²)	Seafloor Macrolitter	38	570± 2,588	66	58	50	38	> 2030	63%
CI23 (item/m ²)	Floating Microplastics	0.000845	0.36 ± 1.9	0.015	0.010	0.008	0.000845	> 2030	80%

Appendix 4

**Updated Guidance Factsheets for IMAP Common Indicators 13, 14, 17, 18, 20 and 21, and
Candidate Common Indicators 26 and 27**

Updated Guidance Factsheets for IMAP EOs 5 and 9 (Common Indicators 13, 14, 17, 18, 20 and 21)

1. Introduction

1. This document presents the revised Guidance Factsheets for IMAP Common Indicators 13, 14, 17, 18, 20, and 21, revising the IMAP Pollution Cluster in accordance with Decision IG.26/3 (COP 23, 2023) concerning the 2023 Mediterranean Quality Status Report (MED QSR) and the Renewed Ecosystem Approach Policy in the Mediterranean.

2. The current revision builds upon achievements endorsed for the preparation of the 2023 Mediterranean Quality Status report (2023 MED QSR) by the Ecosystem Approach Correspondence Group on Pollution, MED POL Focal Points, and Ecosystem Approach Coordination Groups during meetings held in 2020, 2021, 2022 and 2023.

3. These foundational achievements determining the revision of the IMAP Pollution Cluster include:

a) **Strengthening the assessment criteria**, including:

- i. Updating the Background Criteria (BC) and Background Assessment Criteria (BAC) values for IMAP Common Indicator 17, at both at sub-regional and regional levels, and the Environmental Assessment Criteria (EAC) values for IMAP Common Indicator 20.
- ii. Setting reference conditions and Good/Moderate (G/M) boundary values for chlorophyll-a (Chl a), total phosphorus (TP), and dissolved inorganic nitrogen (DIN) in coastal and open (offshore) waters of the Adriatic Sea Sub-region.
- iii. Proposing methodologies for the future revision of EAC values for IMAP Common Indicators 17, 18, and 20, set to commence implementation in 2025.

b) **Defining integration and aggregation rules for monitoring and assessment**, including:

- i. Developing a methodology to propose assessment spatial scales based on monitoring scales defined in national IMAP Pollution monitoring programmes, while also taking into account the assessment areas established under national MSFD monitoring strategies by EU Member State Contracting Parties.
- ii. Establishing rules for the integration of monitoring and assessment areas within the IMAP Pollution and Marine Litter Cluster (Ecological Objectives EO5, EO9, EO10), while considering interrelations with the Coast and Hydrography (EO6, EO7) and Biodiversity (EO1) Clusters.
- iii. Setting rules for the aggregation and integration of assessments across specific IMAP Common Indicators and Ecological Objectives, contributing to an integrated Good Environmental Status (GES) assessment for the IMAP Pollution Cluster.

c) **Development, testing, and implementation of GES and alternative environmental assessment methodologies by applying the integration and aggregation rules, alongside the assessment scales, assessment criteria, and the DPSIR approach within the IMAP nested framework.** This work included:

- i. the NEAT IMAP GES assessment methodology across the nested assessment areas (CIs 13, 14, and 17);
- ii. the CHASE+ assessment methodology (CIs 13, 14, and 17);
- iii. the Ecological Quality Ratio (EQR) methodology (CIs 13 and 14);
- iv. the simplified EQR methodology (CI 14);
- v. the simplified Good/Moderate (G/M) status comparison methodology (CI 14);
- vi. the assessment approach for biological effects, based on the use of relevant literature sources;

- vii. the assessment approach for contaminants in seafood, using concentration limits for contaminants regulated within the EU;
- viii. the assessment approach for bathing water quality, incorporating both the results presented in the European Environment Agency's 2020 Assessment Report on the State of Bathing Water Quality and monitoring data reported under IMAP; and
- ix. the adapted exposure index and assessment methodology in line with EU Threshold Values for Impulsive and Continuous Underwater Sound.

4. Despite the limited data reporting by the Contracting Parties, as stipulated in Decisions IG.23/6 and IG.24/4, based on the results outlined above, **seventeen thematic pollution assessments were developed in 2022 and 2023 for the nine Mediterranean Sea areas/sub-divisions**. These assessments provided the foundation for assessing the four Mediterranean sub-regions, as detailed in the 2023 Mediterranean Quality Status Report (2023 MED QSR). They currently serve as a basis for revising the assessment component of the IMAP Guidance Factsheet.

5. The current revision of IMAP Pollution i.e. Common Indicators 13&14, 17, 18, 20 and 21 also builds upon the following achievements:

- d) **Monitoring Guidelines:** These are structured around specific 97 technical protocols for IMAP Common Indicators 13, 14, 17, 18, 20, and 21, and were comprehensively developed by the MED POL Programme in cooperation with IAEA/MESL. The guidelines were approved by the MED POL Focal Points Meeting in 2021, and thereafter used to reinforce national monitoring efforts.
- e) **Preparation of National IMAPs** and lessons learned during their initial implementation phase.
- f) **Data Standards and Data Dictionaries:** Developed and integrated into the IMAP Info System for IMAP Common Indicators 13, 14, 17, 18, 20, and 21 to support standardized and harmonized data reporting by the Contracting Parties.
- g) **Advancement of Quality Assurance and Quality Control (QA/QC)** efforts through:
 - i. Upgrading interlaboratory QA/QC procedures for IMAP Common Indicator 17, and establishing QA/QC procedures for Common Indicators 13 and 14 (covering inorganic nutrients in high salinity seawater, estuarine and low salinity seawater, and chlorophyll a and phaeopigments in seawater), as well as contaminants in seafood for Common Indicator 20 (including heavy metals, PAHs, dioxins, and PCBs).
 - ii. Defining interlaboratory QA/QC procedures for IMAP Common Indicator 18.
 - iii. Establishing initial data quality control range categories for physico-chemical parameters (Common Indicators 13&14) and contaminants (Common Indicator 17), using appropriate statistical methods and scientific expertise to ensure the quality of data reported into the IMAP Info System. These quality control categories have been integrated into the system as of 2024.
- h) **Incorporating New Scientific and Policy Developments:** Evolutions since 2019 have been leveraged to support the above achievements under IMAP Pollution monitoring and implementation.

2. Guidance Factsheet on IMAP Common Indicators 13 and 14

6. The revision of IMAP **Common Indicator 13 (EO5)**: “Concentration of key nutrients in water column” is presented in the table below.

Indicator Title	Common Indicator 13. Concentration of key nutrients in water column (EO5)	
Relevant GES definition	Related Operational Objective	Proposed Target(s) ¹
Concentrations of nutrients in the euphotic layer are in line with prevailing physiographic, geographic and climate conditions	Human introduction of nutrients in the marine environment is not conducive to eutrophication	State: - Reference nutrients concentrations according to the local hydrological, chemical, and morphological characteristics of the un-impacted marine region. - Decreasing trend of nutrients concentrations in water column of human impacted areas statistically defined, considering the boundary limit between GES and non-GES classes of the assessment scales. Pressure: - Reduction of BOD emissions from land-based sources. - Reduction of nutrients emissions from land-based sources.
Rational		
Justification for indicator selection Eutrophication is a process driven by enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, leading to: increased growth, primary production and biomass of algae; changes in the balance of nutrients causing changes to the balance of organisms; and water quality degradation (IMAP, 2017)². The direct and indirect consequences of eutrophication are undesirable when they degrade ecosystem health and/or the sustainable provision of goods and services, such as algal blooms, dissolved oxygen deficiency, declines in sea-grasses, mortality of benthic organisms and/or fish. Although, these changes may also occur due to natural processes, the management concern begins when they are attributed to anthropogenic sources. Seawaters depending on nutrient loading and phytoplankton growth are classified according to their level of eutrophication. Low nutrient/ phytoplankton levels characterize oligotrophic areas, water enriched in nutrients is characterized as mesotrophic, whereas water rich in nutrients and algal biomass is characterized as eutrophic.		

¹ Following the decisions to be made at the present meeting regarding minor adjustments to the Targets, as outlined in working document UNEP/MED WG.626/3/Rev.1, the revised Targets will be incorporated into the revised IMAP Pollution Indicators Factsheets.

² IMAP (2017) Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria, UN Environment/MAP Athens, Greece, pp 52.

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Policy Context and targets	
Policy context description In the Mediterranean, the UNEP/MAP MED POL Monitoring programme included from its inception the study of eutrophication as part of its seven pilot projects approved by the Contracting Parties at the Barcelona meeting in 1975 (UNEP MAP, 1990a,b). The issue of a consistent monitoring strategy and assessment of eutrophication was first raised at the UNEP/MAP MED POL National Coordinators Meeting in 2001 (Venice, Italy) which recommended to the Secretariat to elaborate a draft programme for monitoring of eutrophication in the Mediterranean coastal waters (UNEP/MAP MED POL, 2003). In spite of a series of assessments reviewing the concept and state of eutrophication, there are important gaps in the capacity to assess the intensity of this phenomenon. Efforts have been devoted to defining the concepts to assess the intensity and to extend experience beyond the initial sites in the Adriatic Sea, admittedly, the most eutrophic area in the entire Mediterranean Sea. In the context of the Mediterranean Sea, the monitoring and assessment of eutrophication were redefined in accordance with the Integrated Monitoring and Assessment Programme (UNEP/MAP, 2016). This redefinition ensures synergy with the European Marine Strategy Framework Directive (200/56/EC). The Data Dictionaries and Standards for IMAP Common Indicators 13 and 14 (2019, http://imapinfosystem.info-rac.org/app/#/standard), aligned with the IMAP Guidance Factsheets, defined the list of mandatory datasets, including physico-chemical parameters, to provide an integrated assessment of eutrophication.	
Targets As part of the preparation for the 2023 MED QSR eutrophication assessment, the NEAT (Nested Environmental Status Assessment Tool) Integrated Assessment for CIs 13 and 14, and The Scale of Simplified Assessment of Chlorophyll a (IMAP Common Indicator 14) have been established and	

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applied in the Mediterranean sub-regions to assess the Good Environmental Status (GES), as applicable. The scales are outlined in the Guidance Factsheet for Common Indicator 14. The reference and boundary values for Dissolved Inorganic Nitrogen (DIN) and Total Phosphorus (TP) have only been set for the Adriatic Sea Sub-region. In the absence of such values for other sub-regions, the scales of other assessment methodologies could not be set, including the Scale of Simplified Assessment, which was only applied to Chlorophyll-a based on satellite-derived data.	
Policy documents General Policy documents Decision IG.22/7 (COP19, 2016) on Integrated Monitoring and Assessment Programme (IMAP) of the Mediterranean Sea and Coast and Related Assessment Criteria. Decision IG.21/3 (COP18,2013) on Ecosystems Approach including adopting definitions of Good Environmental Status (GES) and Targets. Decision IG.25/1 (COP22, 2021) on UNEP/MAP Medium-Term Strategy 2022-2027. Decision IG.22/7 (COP19, 2016) on the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria. Decision IG.23/6 (COP20, 2017) on 2017 Mediterranean Quality Status Report. Decision IG.24/4 (COP21, 2019) on Assessment Studies. Decision 26/3 (COP23, 2023) on the 2023 Mediterranean Quality Status Report and a Renewed Ecosystem Approach Policy in the Mediterranean. UNEP(DEPI)/MED WG.363/Inf.21. (2011) Initial Integrated Assessment. UNEP(DEC)/MED WG.372/3. (2012) Approaches for definition of GES and setting targets for the pollution related ecological objectives in the framework of the ecosystem approach. (EO5: eutrophication, EP9: contaminants, EP10: marine litter, EO11: noise). UNEP(DEPI)/MED IG.22/Inf.7. (2016) Integrated Monitoring and Assessment Guidance UNEP(DEPI)/MED WG.427/Inf.3. Background to the Assessment Criteria for Hazardous Substances and Biological Markers in the Mediterranean Sea Basin and its Regional Scales these revised assessment criteria. 2017 Mediterranean Quality Status Report, https://www.medqsr.org/node/10/ 2023 Mediterranean Quality Status Report, medqsr2023.info-rac.org Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive). Commission Directive (EU) 2017/845 of 17 May 2017 amending Directive 2008/56/EC of the European Parliament and of the Council as regards the indicative lists of elements to be taken into account for the preparation of marine strategies. Commission Decision (EU) 2017/848 of 17 May 2017 laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardized methods for monitoring and assessment, and repealing Decision 2010/477/EU.	

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Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.	
Eutrophication related Policy documents	
UNEP(DEPI)MED WG.231/14. (2003). Eutrophication Monitoring Strategy of UNEP/MAP MED POL.	
UNEP/FAO/WHO (1996). 'Assessment of the state of eutrophication in the Mediterranean Sea'. MAP Technical Reports Series No 106. UNEP, Athens, 211 pp.	
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UNEP(DEPI)/MED WG.417/Inf.15., (2015) Report of the online groups on eutrophication, contaminants and marine litter, pp 92	
UNEP/MED WG.463/Inf.6. (2019) Updated Thematic Assessments of the Eutrophication and Contaminants Status in the Mediterranean Marine Environment, as a Contribution to the 2019 State of Environment and Development Report (SoED).	
UNEP/MED WG.463/8., (2019), Approaches on Scales of Monitoring for Common Indicators related to pollution.	
UNEP/MED WG.463/Inf.9 (2019). Example of overall interrelationships between the IMAP and the DPSIR framework applied to the coastal and marine ecosystem. Meeting of the Ecosystem Approach Correspondence Group on Pollution Monitoring.	
UNEP/MED WG.509/10//Rev.2, (2021) Integration and Aggregation Rules for Monitoring and Assessment of (IMAP Pollution and Marine Litter Cluster).	
UNEP/MED WG 533/ 4. (2022) Assessment Criteria Methodologies for IMAP Common Indicator 13: Reference and Boundary Values for DIN and TP in the Adriatic Sea Sub-region.	
UNEP/MED.WG.550/10/Rev.1, (2023), 2023 Med QSR: The IMAP Pollution Cluster Chapters; Thematic Assessments.	
UNEP/MED.WG.550/Inf.13 (2023), The Marine Environment Assessment in the Areas with Insufficient Data: The Assessment Results of IMAP Common Indicators 14 in the Central Mediterranean Sea Sub-region by Applying the Simplified G/M Assessment Methodology.	
UNEP/MED WG.556/Inf.3/Rev.1. (2023), The Results of GES Assessment for IMAP Common Indicators 13 and 14 in the Adriatic Sea Sub-region by Applying the NEAT GES Assessment Methodology.	

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UNEP/MED WG.556/Inf.4/Rev.1. (2023), The Marine Environment Assessment in the Areas with Insufficient Data: The Assessment Results of IMAP Common Indicators 13&14 in the Aegean - Levantine Sea Sub-region by Applying the Simplified G/M Assessment Methodology. UNEP/MED WG.556/Inf.5/Rev.1. (2023), The Marine Environment Assessment in the Areas with Insufficient Data: The Assessment Results of IMAP Common Indicators 13&14 in the Western Mediterranean Sea Sub-region by Applying the Simplified G/M and EQSR Assessment Methodologies . UNEP/MED WG.556/Inf.16/Rev.1. (2023), The Updated GIS - based Layers for the Finest Areas of Assessment and the Areas of Assessment Nested to the Levels of Integration that are Considered Meaningful for Their Use Within Application of the NEAT GES Assessment Methodology for IMAP Common Indicators 13, 14 and 17 in the Adriatic Sea Sub-region.	
Indicator analysis methods	
Indicator Definition	
Concentration of key (inorganic) nutrients in the water column: Nitrate (NO₃-N) Nitrite (NO₂-N) Ammonium (NH₄-N) Total Nitrogen (TN) Orthophosphate (PO₄-P) Total Phosphorus (TP) Orthosilicate (SiO₄-Si) Sub-Indicators: Nutrient ratios (molar) of silica, nitrogen and phosphorus where appropriate: Si:N, N:P, Si:P The further actions should include scientific elaboration on the adjusted use of the total nitrogen to total phosphorus ratio in assessing eutrophication and ecosystem productivity in relevant Mediterranean sub-regions or sub-divisions, taking into account local ecosystem specificities. The list of all chemical and related parameters subject to reporting for IMAP CI 13 by the Contracting Parties is elaborated in the Data Standards for IMAP CI 13.	
Methodology for indicator calculation	
All: Spectrophotometry (manually or automated methods and instrumentation) The detailed analytical procedure nutrients and other related mandatory parameters, including sampling and sample transportation, analytical determination of indicators and sub-indicators, data quality control are outlined in A-2: Guidelines/Protocols for sampling and determination of key nutrients and chlorophyll a in seawater outlines the analytical procedures for the determination of Chlorophyll a and its related sub-indicators.	
Indicator units	
All: micromol per liter, that is micromolar concentration (μmol/L =μM) Ratios: adimensional (simple mathematical derivation of ratios from nutrient concentrations) Data Standards for IMAP CI 13 elaborates units for all mandatory parameters.	

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List of Guidance documents and protocols available IMAP Monitoring Guidelines/Protocols (https://www.iaea.org/about/organizational-structure/department-of-nuclear-sciences-and-applications/division-of-iaea-environment-laboratories/marine-environmental-studies-laboratory/unep-map-med-pol-integrated-monitoring-and-assessment-programme-imap-monitoring-guidelines) ○ A-1. Monitoring Guidelines/Protocols for Sampling and Determination of Hydrographic Physical and Chemical Parameters; ○ A-2: Guidelines/Protocols for sampling and determination of key nutrients and chlorophyll a in seawater outlines the analytical procedures for the determination of Chlorophyll a and its related sub-indicators; ○ E-1. Monitoring Guidelines/Protocols for Analytical Quality Assurance for IMAP Common Indicators 13, 14, 17, 18 and 20; ○ F-1. Monitoring Guidelines/Protocols for Reporting Monitoring Data for IMAP Common Indicators 13, 14, 17, 18 and 20.	
Data Confidence and uncertainties Despite the great variability born by the water layers subject to active hydrodynamic processes, monitoring the characteristics of the seawater is still the most direct way of assessing eutrophication. Inorganic nutrients may be determined either at the surface or at various depths. An external quality assurance by performing regional interlaboratory QA/QC exercises has been organized for contaminants in collaboration of the UNEP/MAP - MED POL and the IAEA/MESL since 1986. As of 2024, the IAEA/MESL, the scope of proficiency testing and training courses has been expanded to support the capacities of national laboratories in monitoring eutrophication (IMAP Common Indicators 13 & 14: inorganic nutrients in high salinity seawater, in estuarine and low salinity seawater, and chlorophyll a and Phaeopigments in Seawater) and contaminants in seafood (IMAP Common Indicator 20: heavy metals, polycyclic aromatic hydrocarbons (PAHs), dioxins, and PCBs). In addition, the data quality control range categories were initially established for physico-chemical parameters related to the monitoring of IMAP Common Indicators 13 and 14, as well as for contaminants related to the monitoring of Common Indicator 17, by applying relevant statistical methods and available scientific expertise in ensuring the quality of data reported to the IMAP Info System. These data control categories have been integrated into the IMAP Info System as of 2024.	
Methodology for monitoring, temporal and spatial scope Available Methodologies for Monitoring and Monitoring Protocols Traditional methods for eutrophication monitoring in coastal waters involve <i>in situ</i> sampling/measurements of commonly measured parameters such as nutrients concentration. Concerning available methods for <i>in situ</i> measurements, ships provide flexible platforms for eutrophication monitoring, while remote sensing provides opportunities for a synoptic view over regions or sub-regions. Besides traditional ship measurements, ferry-boxes and other autonomous measuring devices have been developed that allow high frequency and continuous measurements. Sampling for the determination of <i>in vitro</i> fluorescence and nutrient analysis may be carried out with relatively little effort if a properly equipped pump and hose system are mounted on the vessel. Measurements may be taken at the surface or just below it using a water intake on the vessel's hull, at fixed or varying depths with a towed "fish" and pumping system. Building on elements elaborated in the Integrated Monitoring and Assessment Programme (2016 IMAP), including the above-mentioned components, the Monitoring Guidelines—structured around	

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the specific technical protocols related to IMAP Common Indicators 13 and 14—were comprehensively developed by the MED POL Programme in cooperation with IAEA/MESL. These guidelines were approved by the MED POL Focal Points Meeting (2021). They build upon the knowledge and practices obtained over 40 years of MED POL monitoring implementation and recent publications, highlighting the current practices of the Contracting Parties' marine laboratories, as well as other Regional Seas Conventions and the EU. A thorough analysis of presently available practices of UNEP/MAP, UNEP and IAEA, as well the HELCOM, OSPAR and European Commission Joint Research Centre was undertaken to assist an innovative approach for preparation of the IMAP Monitoring Guidelines/Protocols. The monitoring methodologies and practices are elaborated for sampling, sample preservation and transportation, sample preparation and analysis, along with quality assurance and reporting of monitoring data, for their use by the IMAP competent laboratories in order to ensure the representativeness and accuracy of the analytical results. These guidelines present a summary of the best available known practices employed in marine monitoring by bringing integrated comprehensive analytical practices that can be applied in order to ensure the representativeness and accuracy of the analytical results needed for generation of quality assured monitoring data. The Monitoring Guidelines for IMAP Common Indicators 13 and 14 outline the following monitoring and reporting practices: ○ A-1. Monitoring Guidelines/Protocols for Sampling and Determination of Hydrographic Physical and Chemical Parameters; ○ A-2: Guidelines/Protocols for sampling and determination of key nutrients and chlorophyll a in seawater outlines the analytical procedures for the determination of Chlorophyll a and its related sub-indicators; ○ E-1. Monitoring Guidelines/Protocols for Analytical Quality Assurance for IMAP Common Indicators 13, 14, 17, 18 and 20; ○ F-1. Monitoring Guidelines/Protocols for Reporting Monitoring Data for IMAP Common Indicators 13, 14, 17, 18 and 20.	
Available data sources IMAP Info System (http://imapinfosystem.info-rac.org/app/#/) EMODNET Chemistry: http://www.emodnet-chemistry.eu/data_access.html EEA Waterbase - Transitional, coastal and marine waters: http://www.eea.europa.eu/data-and-maps/data/waterbase-transitional-coastal-and-marine-waters-11	
Spatial scope guidance and selection of monitoring stations The first factor promoting eutrophication is nutrient enrichment. This explains why the main eutrophic areas are to be found primarily not far from the coast, mainly in areas receiving high nutrient loads, despite some natural symptoms of eutrophication can also be found, such as in upwelling areas. Additionally, the risk of eutrophication is linked to the capacity of the marine environment to confine growing algae in the well-lighted surface layer. The geographical extent of potentially eutrophic waters may vary widely, depending on: (i) the extent of shallow areas, i.e. with depth ≤ 20 m; (ii) the extent of stratified river plumes, which can create a shallow surface layer separated by a halocline from the bottom layer, whatever its depth; (iii) extended water residence times in enclosed seas leading to blooms triggered to a large degree by internal and external nutrient pools; and (iv) upwelling phenomena leading to autochthonous nutrient supply and high nutrient concentrations from deep water nutrient pools, which can be of natural or human origin.	

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Therefore, the geographical scale of monitoring for the assessment of GES for eutrophication will depend on the hydrological and morphological conditions of an area, particularly the freshwater inputs from rivers, the salinity, the general circulation, upwelling and stratification. The spatial distribution of the monitoring stations should, prior to the establishment of the eutrophication status of the marine sub-region/area, be risk-based and proportionate to the anticipated extent of eutrophication in the sub-region under consideration as well as its hydrographic characteristics aiming for the determination of spatially homogeneous areas. The eutrophication monitoring programmes should pursue to assess the eutrophication phenomena, based on the differentiation of the scale and time dependant signals from human induced versus natural eutrophication. As part of the 2023 MED QSR preparation, the assessment scales for CIs 13 and 14 are defined within the framework of the IMAP nested approach, building upon the elements outlined in the section on Assessment of Eutrophication.	
Temporal Scope guidance Flexibility should be incorporated into the design of the monitoring programme to take account of differences in each marine sub-region/area. At the Mediterranean Sea latitudes, in general terms, the pre-summer and winter primary production bloom intensity peaks of natural eutrophication define the strategy for the sampling frequency, although year-round measurements of nutrients may be more appropriate. The current national eutrophication monitoring programme, developed within the framework of IMAP implementation, has laid the foundation for marine environment monitoring in the Mediterranean. The optimum frequency (seasonal 2 to 4 times per year or monthly 12 times per year) for the monitoring of nutrients at the selected stations should be chosen taking into account the necessity of both to control the deviations of the known natural cycles of eutrophication in coastal areas and the control of (decreasing) trends monitoring impacted areas, therefore, from low frequency (minimum) to high frequency measurements. Therefore, either for impacted or non-impacted coastal waters the optimal frequency per year and sampling locations needs to be selected at a local scale, whilst for open waters the sampling frequency to be determined on a sub-regional level following a risk-based approach. Mainly, in order to build a robust sampling frequency scale in future a sounded statistical approach has to be developed that takes into account the discriminant limit between classes when the nutrient boundaries approach will be widely accepted. Let consider the approach developed for CI14 - Chlorophyll a concentration in water column as an example to be used, as for this CI accepted boundaries exists. Sampling frequency is determined by the variability of the measured parameters and is usually determined by how many samples are needed to reliably assess the differences between two neighbouring mean values. Discriminant limit (ie power of applied test), depends on sample size: Discriminant limit $dM = sd * t(\alpha/2; N1+N2-2) * \sqrt{2; N1+N2-2}$ For Chl-a log10 units for different sample size N with the significance level: $\alpha/2 = 0,025$; with an average $sd = 0.30$	

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$N = 12 \quad t = 2.074 \sqrt{\quad}$ $N = 24 \quad t = 2.013 \sqrt{\quad} = 24 = 0.289 \text{ dM} > 0.17$ $N = 52 \quad t = 1.983 \sqrt{\quad} = 52 = 0.196 \text{ dM} > 0.12$ Based on the above, it follows that a particular area can be characterized best by measuring three relevant depths (typically 0, 5 and 10 m) at one station at least monthly or at three stations one depth (0 m). It is based on 36 samples annually which discriminates approximately 0.15 chl_a log₁₀ unit for mesotrophic - eutrophic area that is slightly less than half difference between two classes (0.37 as log₁₀ unit). Due to the smaller standard deviation in an oligotrophic area, the same results are achieved with half the frequency. The following sampling frequency is recommended as the guidance taking into account specific local conditions: ○ Eutrophic – mesotrophic: monthly, ○ Mesotrophic – oligotrophic: monthly near the coast, bimonthly in open waters, and ○ Oligotrophic: bimonthly near the coast, seasonally in open waters.	
Data analysis and assessment outputs	
Despite the individual nutrient concentrations and nutrient ratios are evaluated based on statistical analysis against known reference levels and known marine eutrophication processes, following the evaluation of information provided by a number of countries and other available information, it has to be noted that the Mediterranean countries are using different eutrophication non-mandatory assessment methods such as TRIX, UNTRIX, Eutrophication scale, EI, HEAT, OSPAR, etc. Nutrients concentrations are part of these tools and is very important to continue to be used at sub-regional or national levels because there is a long-term experience within countries which can reveal / be used for assessing eutrophication trends. As part of the preparation for the 2023 MED QSR, the most relevant and applicable methods for eutrophication assessment were explored, developed, and applied, as outlined in the following section. Further advancements in eutrophication assessment should address the gaps identified during the 2023 MED QSR process to enhance coherency and comparability regarding of eutrophication assessment methodologies. Assessment Criteria As part of the preparation for the 2023 MED QSR, updated reference and boundary values were provided for Chlorophyll a. Additionally, new reference and boundary values were developed for Total Phosphorus (TP) and Dissolved Inorganic Nitrogen (DIN), as adopted by Decision 26/3 (COP23) on the 2023 Mediterranean Quality Status Report and a Renewed Ecosystem Approach Policy in the Mediterranean (Table 1 below). However, due to insufficient data from other sub-regions, assessment criteria for DIN and TP were not established outside the Adriatic Sea Sub-region. Table 1. Coastal water types in the Mediterranean, along with the new reference conditions and boundary values for Total Phosphorous (TP) and Dissolved Inorganic Nitrogen (DIN) for coastal and open (offshore) waters in the Adriatic Sea Sub-region. <i>Reference conditions and boundary (Good/Moderate status) values are based on long time series (>5 years) of monthly sampling at least.</i>	

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	Coastal waters Water Typology Type I Type I Adriatic Type II-A-FR-SP ^d Type II-A Adriatic Type II-A ^e Tyrrhenian Type III-W Adriatic ^e Type III-W Tyrrhenian Type III-W-FR-SP Type III-E Type Island-W	Reference conditions of c(TP) (μmol/L) 0,19 ^a - 0,16 ^a - - - - - - -	Boundaries of c(TP) (μmol/L) for G/M status 0,55 ^a - 0,48 ^a - 0,26 - - - - -
		Open (offshore) waters in the Adriatic Sea Sub-region Water Typology Type I Adriatic Type II-A Adriatic Type III-W Adriatic ^e	
		Reference conditions of c(DIN) (μmol/L) 0,21 ^g ; 0,66 ^h - -	Boundaries of c(DIN) (μmol/L) for G/M status 22.3 - -
		^a From Giovanardi et al, 2018 ^e 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 ^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.	
		Ongoing efforts focus on establishing the new reference and boundary values for Total Phosphorus (TP) and Dissolved Inorganic Nitrogen (DIN), and the updated reference and boundary values, where applicable, for Chlorophyll a (Chl a), in the selected pilot sub-region(s)/sub-division(s), depending on data availability. Future efforts should also address the need on establishing assessment criteria for phosphate.	
		Assessment of Eutrophication As suggested by the on-line expert group on eutrophication established by the Contracting Parties it is recommended that with regard to nutrient concentrations, until commonly agreed thresholds have been determined and agreed upon, GES may be determined on a levels and trend monitoring basis. The assessment methodologies for eutrophication, as developed and applied for the preparation of the 2023 MED QSR, are detailed in the IMAP Guidance Factsheet for IMAP CI 14. Due to the limited data available for nutrients, an integrated NEAT GES assessment was applied for CIs 13 and 14, focusing on total phosphorus and dissolved inorganic nitrogen along with Chlorophyll a in the Adriatic Sea Sub-region.	

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Known gaps and uncertainties in the Mediterranean		
Nutrient, transparency and oxygen thresholds and reference values may not be identical for all areas, since it is recognized that area-specific environmental conditions must define threshold values. GES could be defined on a sub-regional level, or on a sub-division of the sub-region (such as the Northern Adriatic), due to local specificities in relation to the trophic level and the morphology of the area.		
Further to the significant progress achieved over the last few biennia regarding the standardizing monitoring practices and establishing Good Environmental Status (GES) and environmental assessment tools—along with the improved availability of assessment criteria – it is essential for a complete assessment of eutrophication and the achievement of GES, to define GES thresholds and reference conditions (natural background concentrations) not only for chlorophyll <i>a</i>, but also for total phosphorus (TP) and dissolved inorganic nitrogen (DIN) across all sub-regions. This should build on the relevant experience gained in setting reference and boundary values for these nutrients in the Adriatic Sea Sub-region, as minimum requirements. This process should include quality assurance schemes, as well as data quality control protocols. The progress in establishing reference and boundary values for total phosphorus (TP) and dissolved inorganic nitrogen (DIN) is outlined in the section above.		
By building on the achievements up to 2023, during the preparation of the 2023 MED QSR, several knowledge gaps were identified in the monitoring and assessment of Common Indicators 13 and 14, which need to be addressed following the recommendations of the 2023 MED POL Focal Points Meeting, as outlined in the Guidance Factsheet for IMAP CI 14.		
Contacts and Version Date		
http://www.unepmap.org		
Version No	Date	Author
V.1	31.5.17	MEDPOL
V.2	10.1.19	MEDPOL
Final version	31/05/2019	Approved by the Meeting of MED POL FPs
Final version	09/09/2019	Approved by the 7 th Meeting of EcAp Coordination Group
V4	28/05/2025	Joint CorMon Pollution and ML Meeting
V5		Approved by the Meeting of MED POL FPs
Final version		Approved by the 12 th Meeting of EcAp Coordination Group

7. The revision of IMAP **Common Indicator 14 (EO5)**: “Chlorophyll *a* concentration in water column” is presented in the table below.

Indicator Title	Common Indicator 14. Chlorophyll <i>a</i> concentration in water column (EO5)	
Relevant GES definition	Related Operational Objective	Proposed Target(s)³

³ Following the decisions to be made at the present meeting regarding minor adjustments to the Targets, as outlined in working document UNEP/MED WG.626/3/Rev.1, the revised Targets will be incorporated into the revised IMAP Pollution Indicators Factsheets.

Indicator Title	Common Indicator 14. Chlorophyll <i>a</i> concentration in water column (EO5)	
Natural levels of algal biomass, water transparency and oxygen concentrations in line with prevailing physiographic, geographic and weather conditions	Direct and indirect effects of nutrient over-enrichment are prevented	State: - Chlorophyll <i>a</i> concentration in high-risk areas below the boundary limit between GES and non-GES classes of the assessment scales. - Decreasing trend in Chl-<i>a</i> concentrations in high-risk areas affected by human activities. - Index of turbidity below the boundary limit between GES and non-GES classes of the assessment scales to be set upon defining the turbidity assessment criteria ⁴. - Increasing trend of transparency in areas impacted by human activities ⁵. - Dissolved oxygen concentrations in high-risk areas below the boundary limit between GES and non-GES classes of the assessment scales to be set upon defining the oxygen concentrations assessment criteria ⁶. - Increasing trend in dissolved oxygen concentrations in areas impacted by human activities ⁷.
Rational		
Justification for indicator selection Eutrophication is a process driven by enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, leading to: increased growth, primary production and biomass of algae; changes in the balance of nutrients causing changes to the balance of organisms; and water quality degradation (IMAP, 2017)⁸. The consequences of eutrophication are undesirable if they appreciably		

⁴ Transferred from Indicator 5.2.2, Decision IG. 21/3, Annex I

⁵ *ibidem*

⁶ Transferred from Indicator 5.3.1, Decision IG. 21/3, Annex I

⁷ *ibidem*

⁸ IMAP (2017) Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria, UN Environment/MAP Athens, Greece, pp 52.

Indicator Title	Common Indicator 14. Chlorophyll <i>a</i> concentration in water column (EO5)
degrade ecosystem health and/or the sustainable provision of goods and services, such as excessive algal blooms, dissolved oxygen deficiency, declines in sea-grasses, mortality of benthic organisms and/or fish. Although, these changes may also occur due to natural processes, the management concern begins when they are attributed to anthropogenic sources. Seawaters depending on nutrient loading and phytoplankton growth are classified according to their level of eutrophication. Low nutrient/ phytoplankton levels characterize oligotrophic areas, water enriched in nutrients is characterized as mesotrophic, whereas water rich in nutrients and algal biomass is characterized as eutrophic.	
Scientific References Norris, N. 1940. The Standard Errors of the Geometric and Harmonic Means and Their Application to Index Numbers. <i>Ann. Math. Statist.</i> 11(4): 445-448. doi:10.1214/aoms/1177731830 Kirkwood, T.B.L., 1979. Geometric means and measures of dispersion. <i>Biometrics</i>, 35, 908-909. Giovanardi, F., Tromellini, E., (1992). An empirical dispersion model for total phosphorus in a coastal area: the Po River-Adriatic system. <i>Sci. Total Environ. Supplement</i> 201–210. doi:10.1016/B978-0444-9990-3.50022-5. Vollenweider, R.A., Giovanardi F., Montanari, G., Rinaldi A., 1998. Characterization of the trophic conditions of marine coastal waters, with special reference to the NW Adriatic Sea: proposal for a trophic scale, turbidity and generalized water quality index. <i>Environmetrics</i>, 9, 329-357. Cushman-Roisin, B., Gačić, M., Poulain, P-M., Artegiani, A., 2001. <i>Physical Oceanography of the Adriatic Sea, Past, Present and Future</i>, Springer Science + Business Media, Dordrecht, 312 pp. Boyer J.N. Kelble C.R., Ortner P.B., Rudnick D.T., 2009. Phytoplankton bloom status: Chlorophyll <i>a</i> biomass as an indicator of water quality condition in the southern estuaries of Florida, USA. <i>Ecological Indicators</i> 9s:s56- s67. Carletti, A., Heiskanen, A. S. (2009). Water Framework Directive intercalibration technical report. Part 3: Coastal and Transitional waters. JRC-IES EUR 23838 EN/3, pp 244. Hering, D., Borja, A., Carstensen, J., Carvalho, L., Elliott, M., and Feld, C. K. (2010). The European water framework directive at the age of 10: a critical review of the achievements with recommendations for the future. <i>Sci. Total Environ.</i> 408, 4007–4019. Primpas I., Karydis M., 2011. Scaling the trophic index (TRIX) in oligotrophic marine environments. <i>Environmental Monitoring and Assessment</i> July 2011, Volume 178, Issue 1-4, pp 257-269. Borja, A., Elliott, M., Henriksen, P., and Marb, N. (2013). Transitional and coastal waters ecological status assessment: advances and challenges resulting from implementing the European water framework directive. <i>Hydrobiologia</i> 704, 213–229. doi: 10.1007/s10750-012-1276-9 Borja A., Elliott M., Andersen J.H., Berg T., Carstensen J., Halpern B.S., Heiskanen A.-S., Korpinen S., Lowndes J.S.S., Martin G. and Rodriguez-Ezpeleta N. (2016) Overview of Integrative Assessment of Marine Systems: The Ecosystem Approach in Practice. <i>Front. Mar. Sci.</i>, 3: 20. doi: 10.3389/fmars.2016.00020. Dworak, T., Berglund, M., Haider, S., Leujak, W. and Claussen, U. (2016). A comparison of European nutrient boundaries for transitional, coastal and marine waters. Working Group on ecological Status ECOSTAT Berg, T., Murray, C., Carstensen, J., and Andersen, J. H. (2017). NEAT – Nested Environmental Status Assessment Tool - Manual Version 1.3. DEVOTES project.	

Indicator Title	Common Indicator 14. Chlorophyll <i>a</i> concentration in water column (EO5)
Nemati, H., M. R. Shokri, Z. Ramezani-pour, G. H. Ebrahimi Pour, I. Muxika, Á. Borja, 2017. Using multiple indicators to assess the environmental status in impacted and non-impacted bathing waters in the Iranian Caspian Sea. <i>Ecological Indicators</i>, 82: 175-182. Giovanardi, F., Francé, J., Mozetič, P., Precali, R. (2018). Development of ecological classification criteria for the Biological Quality Element phytoplankton for Adriatic and Tyrrhenian coastal waters by means of chlorophyll <i>a</i> (2000/60/EC WFD). <i>Ecological Indicators</i>. 93. 316-332. doi: 10.1016/j.ecolind.2018.05.015. Borja, A., J. M. Garmendia, I. Menchaca, A. Uriarte, Y. Sagarmínaga, 2019. Yes, We Can! Large-Scale Integrative Assessment of European Regional Seas, Using Open Access Databases. <i>Frontiers in Marine Science</i>, 6: 10.3389/fmars.2019.00019. Pavlidou, A., N. Simboura, K. Pagou, G. Assimakopoulou, V. Gerakaris, I. Hatzianestis, P. Panayotidis, M. Pantazi, N. Papadopoulou, S. Reizopoulou, C. Smith, M. Triantaphyllou, M. C. Uyarra, I. Varkitzi, V. Vassilopoulou, C. Zeri, A. Borja, 2019. Using a holistic ecosystem-integrated approach to assess the environmental status of Saronikos Gulf, Eastern Mediterranean. <i>Ecological Indicators</i>, 96: 336-350. Borja, A., I. Menchaca, J. M. Garmendia, J. Franco, J. Larreta, Y. Sagarminaga, Y. Schembri, R. González, R. Antón, T. Micallef, S. Camilleri, O. Solaun, A. Uriarte, M. C. Uyarra, 2021. Big Insights From a Small Country: The Added Value of Integrated Assessment in the Marine Environmental Status Evaluation of Malta. <i>Frontiers in Marine Science</i>, 8: 10.3389/fmars.2021.638232. Kazanidis, G., C. Orejas, A. Borja, E. Kenchington, L.-A. Henry, O. Callery, M. Carreiro-Silva, H. Egilsdottir, E. Giacomello, A. Grehan, L. Menot, T. Morato, S. Á. Ragnarsson, J. L. Rueda, D. Stirling, T. Stratmann, D. van Oevelen, A. Palialexis, D. Johnson, J. M. Roberts, 2020. Assessing the environmental status of selected North Atlantic deep-sea ecosystems. <i>Ecological Indicators</i>, 119: 106624. R Development Core Team (2022). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0. http://www.R-project.org	
Policy Context and Targets	
Policy context description In the Mediterranean, the UNEP/MAP MED POL Monitoring programme included from its inception the study of eutrophication as part of its seven pilot projects approved by the Contracting Parties at the Barcelona meeting in 1975 (UNEP MAP, 1990a,b). The issue of a consistent monitoring strategy and assessment of eutrophication was first raised at the UNEP/MAP MED POL National Coordinators Meeting in 2001 (Venice, Italy) which recommended to the Secretariat to elaborate a draft programme for monitoring of eutrophication in the Mediterranean coastal waters (UNEP/MAP MED POL, 2003). In spite of a series of assessments reviewing the concept and state of eutrophication, there are important gaps in the capacity to assess the intensity of this phenomenon. Efforts have been devoted to defining the concepts to assess the intensity and to extend experience beyond the initial sites in the Adriatic Sea, admittedly, the most eutrophic area in the entire Mediterranean Sea. In the context of the Mediterranean Sea, the monitoring and assessment of eutrophication were redefined in accordance with the Integrated Monitoring and Assessment Programme (UNEP/MAP, 2016). This redefinition ensures synergy with the European Marine Strategy Framework Directive (200/56/EC). The Data Dictionaries and Standards for IMAP Common Indicators 13 and 14 (2019, http://imapinfosystem.info-rac.org/app/#/standard), aligned	

b) The Scale of Simplified Assessment of Chlorophyll a (IMAP Common Indicator 14)

Indicator Title	Common Indicator 14. Chlorophyll <i>a</i> concentration in water column (EO5)																	
criteria, in cases where Contracting Parties have not reported proven relationship between <i>in situ</i> Chl-a and satellite-derived data., • The data were aggregated as a five-year geometric mean and normalized to ensure comparability across the assessed areas. For normalization, the bestNormalize package in R was used, identifying the Ordered Quantile Normalizing Transformation as the most suitable method (Bartlett, 1947; Beasley et al., 2009). • The GES/non-GES decision rule is established by comparing the calculated value to a boundary limit defined by the Good/Moderate (G/M) threshold. This threshold is set at the 85th percentile of the normalized distribution of calculated values, which is approximately equal to the mean plus one standard deviation (~mean +1 SD). In this distribution, the 50th percentile represents the mean value, while the 25th percentile corresponds to the mean value in heavily impacted areas. • The reference conditions (RC) values were calculated from the normalized values and were represented by the 10th percentile. • Values above the boundary limit are classified as GES, while values below the boundary limit are considered non-GES. • By selecting the 85th percentile of the normalized distribution of calculated values as the G/M boundary limit, the classification compatibility is ensured for the application of the Simplified Assessment Methodology and the five-class GES/non-GES scale, as established for the NEAT GES assessment. • In cases where discrepancies arise between the regional assessment results based on statistically derived satellite data and national assessments utilizing <i>in situ</i> data and nationally developed assessment scales, the findings of national assessments should also be considered—provided they are supported by a scientifically-evidenced justification from national experts.																		
<table><tr><th rowspan="2">Simplified Assessment of CI 14</th><th colspan="2">GES</th><th>non-GES</th></tr><tr><td>≤10th % (RC)</td><td>>10th % CHL_GM ≤85th %</td><td>CHL_GM.>85th %</td></tr><tr><td>Good/non-Good</td><td colspan="2">G/</td><td>M</td></tr><tr><td colspan="4">*Percentiles are calculated from the normalized annual geometric mean (using Ordered Quantile transformation) over a minimum period of five years</td></tr></table>				Simplified Assessment of CI 14	GES		non-GES	≤10 th % (RC)	>10 th % CHL_GM ≤85 th %	CHL_GM.>85 th %	Good/non-Good	G/		M	*Percentiles are calculated from the normalized annual geometric mean (using Ordered Quantile transformation) over a minimum period of five years			
Simplified Assessment of CI 14	GES		non-GES															
	≤10 th % (RC)	>10 th % CHL_GM ≤85 th %	CHL_GM.>85 th %															
Good/non-Good	G/		M															
*Percentiles are calculated from the normalized annual geometric mean (using Ordered Quantile transformation) over a minimum period of five years																		
Further details can be found in thematic eutrophication assessments and the 2023 MED QSR Pollution Assessments, as presented and approved by the Integrated Meeting of the Ecosystem Approach Correspondence Groups (CORMONs), held in Athens, Greece, on 27–28 June 2023.																		
Policy documents General Policy documents Decision IG.22/7 (COP19, 2016) on Integrated Monitoring and Assessment Programme (IMAP) of the Mediterranean Sea and Coast and Related Assessment Criteria. Decision IG.21/3 (COP18,2013) on Ecosystems Approach including adopting definitions of Good Environmental Status (GES) and Targets. Decision IG.25/1 (COP22, 2021) on UNEP/MAP Medium-Term Strategy 2022-2027. Decision IG.22/7 (COP19, 2016) on the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria. Decision IG.23/6 (COP20, 2017) on 2017 Mediterranean Quality Status Report.																		

Indicator Title	Common Indicator 14. Chlorophyll <i>a</i> concentration in water column (EO5)
Decision IG.24/4 (COP21, 2019) on Assessment Studies. Decision 26/3 (COP23, 2023) on the 2023 Mediterranean Quality Status Report and a Renewed Ecosystem Approach Policy in the Mediterranean. UNEP(DEPI)/MED WG.363/Inf.21. (2011) Initial Integrated Assessment. UNEP(DEC)/MED WG.372/3. (2012) Approaches for definition of GES and setting targets for the pollution related ecological objectives in the framework of the ecosystem approach. (EO5: eutrophication, EP9: contaminants, EP10: marine litter, EO11: noise). UNEP(DEPI)/MED IG.22/Inf.7. (2016) Integrated Monitoring and Assessment Guidance UNEP(DEPI)/MED WG.427/Inf.3. Background to the Assessment Criteria for Hazardous Substances and Biological Markers in the Mediterranean Sea Basin and its Regional Scales these revised assessment criteria. 2017 Mediterranean Quality Status Report, https://www.medqsr.org/node/10/ 2023 Mediterranean Quality Status Report, medqsr2023.info-rac.org Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) Commission Directive (EU) 2017/845 of 17 May 2017 amending Directive 2008/56/EC of the European Parliament and of the Council as regards the indicative lists of elements to be taken into account for the preparation of marine strategies. Commission Decision (EU) 2017/848 of 17 May 2017 laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardized methods for monitoring and assessment, and repealing Decision 2010/477/EU. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.	
Eutrophication related Policy documents	
UNEP(DEPI)/MED WG.231/14. (2003). Eutrophication Monitoring Strategy of UNEP/MAP MED POL.	
UNEP/FAO/WHO (1996). 'Assessment of the state of eutrophication in the Mediterranean Sea'. MAP Technical Reports Series No 106. UNEP, Athens, 211 pp.	
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UNEP/MAP MED POL (1990b). Activity V: Research on the effects of pollutants on Marine Communities and Ecosystems (UNEP/MAP MED POL Phase I, 1975-1981).	
WFD CIS Guidance Document No. 5 (2003) Transitional and Coastal Waters Typology, Reference Conditions and Classification Systems.	
UNEP(DEPI)/MED WG.417/Inf.15., (2015) Report of the online groups on eutrophication, contaminants and marine litter, pp 92	
UNEP/MED WG.463/Inf.6. (2019) Updated Thematic Assessments of the Eutrophication and Contaminants Status in the Mediterranean Marine Environment, as a Contribution to the 2019 State of Environment and Development Report (SoED).	

Indicator Title	Common Indicator 14. Chlorophyll <i>a</i> concentration in water column (EO5)
UNEP/MED WG.463/8., (2019), Approaches on Scales of Monitoring for Common Indicators related to pollution. UNEP/MED WG.463/Inf.9 (2019). Example of overall interrelationships between the IMAP and the DPSIR framework applied to the coastal and marine ecosystem. Meeting of the Ecosystem Approach Correspondence Group on Pollution Monitoring. UNEP/MED WG.509/10//Rev.2, (2021) Integration and Aggregation Rules for Monitoring and Assessment of (IMAP Pollution and Marine Litter Cluster). UNEP/MED WG 533/ 4. (2022) Assessment Criteria Methodologies for IMAP Common Indicator 13: Reference and Boundary Values for DIN and TP in the Adriatic Sea Sub-region. UNEP/MED.WG.550/10/Rev.1, (2023), 2023 Med QSR: The IMAP Pollution Cluster Chapters; Thematic Assessments. UNEP/MED.WG.550/Inf.13 (2023), The Marine Environment Assessment in the Areas with Insufficient Data: The Assessment Results of IMAP Common Indicators 14 in the Central Mediterranean Sea Sub-region by Applying the Simplified G/M Assessment Methodology. UNEP/MED WG.556/Inf.3/Rev.1. (2023), The Results of GES Assessment for IMAP Common Indicators 13 and 14 in the Adriatic Sea Sub-region by Applying the NEAT GES Assessment Methodology. UNEP/MED WG.556/Inf.4/Rev.1. (2023), The Marine Environment Assessment in the Areas with Insufficient Data: The Assessment Results of IMAP Common Indicators 13&14 in the Aegean - Levantine Sea Sub-region by Applying the Simplified G/M Assessment Methodology. UNEP/MED WG.556/Inf.5/Rev.1. (2023), The Marine Environment Assessment in the Areas with Insufficient Data: The Assessment Results of IMAP Common Indicators 13&14 in the Western Mediterranean Sea Sub-region by Applying the Simplified G/M and EQSR Assessment Methodologies. UNEP/MED WG.556/Inf.16/Rev.1. (2023), The Updated GIS - based Layers for the Finest Areas of Assessment and the Areas of Assessment Nested to the Levels of Integration that are Considered Meaningful for Their Use Within Application of the NEAT GES Assessment Methodology for IMAP Common Indicators 13, 14 and 17 in the Adriatic Sea Sub-region.	
Indicator analysis methods	
Indicator Definition	
Chlorophyll <i>a</i> concentration in the water column (State, Impact Indicator); Sub-Indicators: Water Transparency (State, Impact Indicator) and Dissolved oxygen (State, Impact Indicator) The list of all chemical and related parameters subject to reporting for IMAP CI 14 by the Contracting Parties is elaborated in the Data Standards for IMAP CI 14.	
Methodology for indicator calculation	
Chlorophyll <i>a</i>: Spectrophotometry. ISO 10260 (1992) on spectrometric determination of the chlorophyll <i>a</i> concentration provides a standard method for quantification of chlorophyll <i>a</i>. Water transparency: measured as Secchi disk depth or according to ISO 7027:1999 Water Quality-Determination of Turbidity Dissolved Oxygen: Chemical methods, Oxygen sensors, etc. measured near the bottom (under the euphotic layer/oxycline)	

Indicator Title	Common Indicator 14. Chlorophyll <i>a</i> concentration in water column (EO5)
The detailed analytical procedure for Chlorophyll <i>a</i> and other related mandatory parameters, including sampling and sample transportation, analytical determination of indicators and sub-indicators, data quality control are outlined in A-2: Guidelines/Protocols for sampling and determination of key nutrients and chlorophyll <i>a</i> in seawater outlines the analytical procedures for the determination of Chlorophyll <i>a</i> and its related sub-indicators.	
Indicator units microgram per liter (µg/L) - Chlorophyll <i>a</i> meters – Secchi disk depth; NTU Turbidity Scale (Nephelometric Turbidity Units) – Water transparency milligram per liter (mg/L) and % Saturation (if temperature and salinity is known) – Dissolved Oxygen Data Standards for IMAP CI 14 elaborates units for all mandatory parameters.	
List of Guidance documents and protocols available IMAP Monitoring Guidelines/Protocols (https://www.iaea.org/about/organizational-structure/departments-of-nuclear-sciences-and-applications/division-of-iaea-environment-laboratories/marine-environmental-studies-laboratory/unep-map-med-pol-integrated-monitoring-and-assessment-programme-imap-monitoring-guidelines): ○ A-1. Monitoring Guidelines/Protocols for Sampling and Determination of Hydrographic Physical and Chemical Parameters; ○ A-2: Guidelines/Protocols for sampling and determination of key nutrients and chlorophyll <i>a</i> in seawater outlines the analytical procedures for the determination of Chlorophyll <i>a</i> and its related sub-indicators; ○ E-1. Monitoring Guidelines/Protocols for Analytical Quality Assurance for IMAP Common Indicators 13, 14, 17, 18 and 20; ○ F-1. Monitoring Guidelines/Protocols for Reporting Monitoring Data for IMAP Common Indicators 13, 14, 17, 18 and 20.	
Data Confidence and uncertainties Despite the great variability in water layers affected by active hydrodynamic processes, monitoring seawater characteristics remains the most direct method for assessing eutrophication. Several key parameters have been identified as providing valuable information related to eutrophication e.g. chlorophyll <i>a</i>, dissolved oxygen, inorganic nutrients, organic matter, suspended solids, light penetration, aquatic macro-phytes, zoo benthos, etc. They all may be determined either at the surface or at various depths. If only limited means are available, determination of those parameters that synthesize the most information should be retained. For example, Chlorophyll <i>a</i> determination may not offer very precise representations of the system, although it provides valuable insights. Turbidity may also be a good measure of eutrophication, although caution is needed near river mouths, where inert suspended solids may be extremely abundant. Dissolved oxygen is a parameter that integrates a wide range of information on the processes involved in eutrophication, especially when measured near the bottom or, at least, below the euphotic zone, where an oxycline usually appears. An external quality assurance by performing regional interlaboratory QA/QC exercises has been organized for contaminants in collaboration of the UNEP/MAP - MED POL and the IAEA/MESL since 1986. As of 2024, the IAEA/MESL, the scope of proficiency testing and training courses has been expanded to support the capacities of national laboratories in monitoring eutrophication (IMAP Common Indicators 13 & 14: inorganic nutrients in high salinity seawater, in estuarine and low	

Indicator Title	Common Indicator 14. Chlorophyll <i>a</i> concentration in water column (EO5)
salinity seawater, and chlorophyll <i>a</i> and Phaeopigments in Seawater) and contaminants in seafood (IMAP Common Indicator 20: heavy metals, polycyclic aromatic hydrocarbons (PAHs), dioxins, and PCBs). In addition, the data quality control range categories were initially established for physico-chemical parameters related to the monitoring of IMAP Common Indicators 13 and 14, as well as for contaminants related to the monitoring of Common Indicator 17, by applying relevant statistical methods and available scientific expertise in ensuring the quality of data reported to the IMAP Info System. These data control categories have been integrated into the IMAP Info System as of 2024.	
Methodology for monitoring, temporal and spatial scope	
Available Methodologies for Monitoring and Monitoring Protocols	
Traditional methods for eutrophication monitoring in coastal waters involve <i>in situ</i> sampling/measurements of commonly measured parameters such as nutrients concentration, chlorophyll <i>a</i> concentration, phytoplankton abundance and composition, transparency and dissolved oxygen concentration. Concerning available methods for <i>in situ</i> measurements, ships provide flexible platforms for eutrophication monitoring, while remote sensing provides opportunities for a synoptic view over regions or sub-regions. Besides traditional ship measurements, ferry-boxes and other autonomous measuring devices have been developed that allow high frequency and continuous measurements. Modelling and remote sensing should also be considered as complementary, area-integrating approaches alongside <i>in situ</i> measurements, depending on data requirements Modelling and remote sensing should also be considered as complementary, area integrating in addition to <i>in situ</i> measurements, depending on data requirements. In general, <i>in situ</i> measurements always remain necessary to validate and calibrate the models and data calculated from satellite measurements. However, the use of satellite-derived data need to be considered as the proven supplementary modality to the <i>in situ</i> data. A good strategy appears to be a combination of remote sensing with on-site scanning using automatic measuring instruments such as thermo-salinometer, dissolved oxygen sensors and <i>in vivo</i> fluorometer and/or nephelometer. Sampling for the determination of <i>in vitro</i> fluorescence and nutrient analysis may be carried out with relatively little effort if a properly equipped pump and hose system are mounted on the vessel. Measurements may be taken at the surface or just below it using a water intake on the vessel's hull, at fixed or varying depths with a towed "fish" and pumping system. Building on elements elaborated in the Integrated Monitoring and Assessment Programme (2016 IMAP), including the above-mentioned components, the Monitoring Guidelines—structured around the specific technical protocols related to IMAP Common Indicators 13 and 14—were comprehensively developed by the MED POL Programme in cooperation with IAEA/MESL. These guidelines were approved by the MED POL Focal Points Meeting (2021). They build upon the knowledge and practices obtained over 40 years of MED POL monitoring implementation and recent publications, highlighting the current practices of the Contracting Parties' marine laboratories, as well as other Regional Seas Conventions and the EU. A thorough analysis of presently available practices of UNEP/MAP, UNEP and IAEA, as well the HELCOM, OSPAR and European Commission Joint Research Centre was undertaken to assist an innovative approach for preparation of the IMAP Monitoring Guidelines/Protocols. The monitoring methodologies and practices are elaborated for sampling, sample preservation and transportation, sample preparation and analysis, along with quality assurance and reporting of monitoring data, for their use by the IMAP competent laboratories in order to ensure the representativeness and accuracy of the analytical results. These guidelines present a summary of the best available known practices employed in marine monitoring by bringing integrated comprehensive analytical practices that can	

Indicator Title	Common Indicator 14. Chlorophyll <i>a</i> concentration in water column (EO5)
be applied in order to ensure the representativeness and accuracy of the analytical results needed for generation of quality assured monitoring data. The Monitoring Guidelines for IMAP Common Indicators 13 and 14 outline the following monitoring and reporting practices: ○ A-1. Monitoring Guidelines/Protocols for Sampling and Determination of Hydrographic Physical and Chemical Parameters; ○ A-2: Guidelines/Protocols for sampling and determination of key nutrients and chlorophyll <i>a</i> in seawater outlines the analytical procedures for the determination of Chlorophyll <i>a</i> and its related sub-indicators; ○ E-1. Monitoring Guidelines/Protocols for Analytical Quality Assurance for IMAP Common Indicators 13, 14, 17, 18 and 20; ○ F-1. Monitoring Guidelines/Protocols for Reporting Monitoring Data for IMAP Common Indicators 13, 14, 17, 18 and 20.	
Available data sources IMAP Info System (http://imapinfosystem.info-rac.org/app/#/) EMODNET Chemistry: http://www.emodnet-chemistry.eu/data_access.html EEA Waterbase - Transitional, coastal and marine waters: http://www.eea.europa.eu/data-and-maps/data/waterbase-transitional-coastal-and-marine-waters-11 Satellite databases such as in EMIS (http://mcc.jrc.ec.europa.eu/emis/), COPERNICUS, ARGANS France, and the SMED algorithm	
Spatial scope guidance and selection of monitoring stations The extent of eutrophication shows spatial variation, for instance coastal areas versus the open sea. The frequency and spatial resolution of the monitoring programme should reflect this spatial variation in eutrophication status and pressures following a risk-based approach and the precautionary principle. The geographical extent of potentially eutrophic waters may vary widely, depending on: (i) the extent of shallow areas, i.e. with depth ≤ 20 m; (ii) the extent of stratified river plumes, which can create a shallow surface layer separated by a halocline from the bottom layer, whatever its depth (iii) extended water residence times in enclosed seas leading to blooms triggered to a large degree by internal and external nutrient pools; and (iv) upwelling phenomena leading to autochthonous nutrient supply and high nutrient concentrations from deep water nutrient pools, which can be of natural or human origin. Therefore, the geographical scale of monitoring for the assessment of GES for eutrophication depends on the hydrological and morphological conditions of an area, particularly the freshwater inputs from rivers, the salinity, the general circulation, upwelling and stratification. The spatial distribution of the monitoring stations should, prior to the establishment of the eutrophication status of the marine sub-region/area, be risk-based and proportionate to the anticipated extent of eutrophication in the sub-region under consideration as well as its hydrographic characteristics aiming for the determination of spatially homogeneous areas. The eutrophication monitoring programmes should pursue to assess the eutrophication phenomena, based on the differentiation of the scale and time dependent signals from human induced versus natural eutrophication.	

Indicator Title	Common Indicator 14. Chlorophyll <i>a</i> concentration in water column (EO5)				
As part of the 2023 MED QSR preparation, the assessment scales for CIs 13 and 14 are defined within the framework of the IMAP nested approach, building upon the elements outlined in the section on Assessment of Eutrophication.					
Temporal Scope guidance The current national eutrophication monitoring programme, developed within the framework of IMAP implementation, has laid the foundation for marine environment monitoring in the Mediterranean. Sampling frequency has to be determined by the variability of the measured parameters and is usually determined by how many samples are needed to reliably assess the differences between two neighbouring mean values. Discriminant limit (i.e. power of applied test), depends on sample size: $\text{Discriminant limit } dM = sd * t(\alpha/2; N1+N2-2) * \sqrt{(1/N1+1/N2)} \neq 0$ For Chl-<i>a</i> log10 units for different sample size N with the significance level: $\alpha/2 = 0,025$; with an average $sd = 0.30$ N = 12 $t = 2.074 \sqrt{(2/12)} = 0.408$ $dM > 0.25$ N = 24 $t = 2.013 \sqrt{(2/24)} = 0.289$ $dM > 0.17$ N = 52 $t = 1,983 \sqrt{(2/52)} = 0.196$ $dM > 0.12$ Based on the above, it follows that a particular area can be characterized best by measuring three relevant depths (typically 0, 5 and 10 m) at one station at least monthly or at three stations one depth (0 m). It is based on 36 samples annually which discriminates approximately 0.15 chl<i>a</i> log10 unit for mesotrophic - eutrophic area that is slightly less than half difference between two classes (0.37 as log10 unit). Due to the smaller standard deviation in an oligotrophic area, the same results are achieved with half the frequency. The following sampling frequency is recommended as the guidance taking into account specific local conditions: ○ Eutrophic – mesotrophic: monthly, ○ Mesotrophic – oligotrophic: monthly near the coast, bimonthly in open waters, and ○ Oligotrophic: bimonthly near the coast, seasonally in open waters. For open waters sampling frequency should be determined on a sub-regional level following a risk-based approach: ○ Water transparency: <i>id.</i> Chlorophyll <i>a</i>, ○ Dissolved Oxygen: <i>id.</i> Chlorophyll <i>a</i>.					
Data analysis and assessment outputs					
Statistical Analysis and Basis for Aggregation – Water Typology and Assessment Criteria The classification scheme on chlorophyll <i>a</i> concentration developed by MEDGIG as an assessment method easily applicable by all Mediterranean countries based on the indicative thresholds and reference values adopted. The water types for applying eutrophication assessment are based on hydrological parameters characterizing a certain area dynamics and circulation. The main statistical analysis is based on the typology criteria and settings derived from the analysis of influence of freshwater inputs as the main nutrient drivers. More information on is presented in document the UNEP(DEPI)/MED WG 417/Inf.15. Three main types were identified: <table style="width: 100%; border: none;"> <tr> <td style="width: 20%; vertical-align: top;">Type I</td><td style="vertical-align: top;">coastal sites highly influenced by freshwater inputs,</td></tr> <tr> <td style="vertical-align: top;">Type IIA</td><td style="vertical-align: top;">coastal sites moderately influenced not directly affected by freshwater inputs (Continent influence),</td></tr> </table>		Type I	coastal sites highly influenced by freshwater inputs,	Type IIA	coastal sites moderately influenced not directly affected by freshwater inputs (Continent influence),
Type I	coastal sites highly influenced by freshwater inputs,				
Type IIA	coastal sites moderately influenced not directly affected by freshwater inputs (Continent influence),				

Indicator Title	Common Indicator 14. Chlorophyll <i>a</i> concentration in water column (EO5)
Type IIIW	continental coast, coastal sites not influenced/affected by freshwater inputs (western Basin),
Type IIIE	not influenced by freshwater input (Eastern Basin),
Type Island	coast (western Basin).

Coastal water type III was split in two different sub basins, the western and the Eastern Mediterranean s, according to the different trophic conditions and is well documented in literature. It is recommended to define the major coastal water types in the Mediterranean for eutrophication assessment (Table 1).

Table 1. Major coastal water types in the Mediterranean

	Type I	Type IIA, IIA Adriatic	Type IIIW	Type IIIE	Type Island-W
σ _t (density)	<25	25<d<27	>27	>27	All range
Salinity	<34.5	34.5<S<37.5	>37.5	>37.5	All range

With the view to assess eutrophication, it is recommended to rely on the classification scheme on Chlorophyll *a* concentration (µg L⁻¹) in coastal waters as a parameter easily applicable by all Mediterranean countries based on the indicative thresholds and reference values presented in Table 2. 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.

In preparation for the 2023 MED QSR, updated reference and boundary values for Chlorophyll *a* were provided, as adopted by Decision 26/3 (COP23) on the 2023 Mediterranean Quality Status Report and a Renewed Ecosystem Approach Policy in the Mediterranean (Table 2 below).

Table 2. Coastal water types reference conditions and boundary values for Chlorophyll *a* 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 (COP 20, 2019). Unshaded cells represent the new criteria adopted in Decision 26/3 (COP23, 2023) on the 2023 Mediterranean Quality Status Report and a Renewed Ecosystem Approach Policy in the Mediterranean. Reference conditions and boundary (Good/Moderate status) 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). The blue-marked cells display the *G* mean values of reference and boundary values, expressed as the 90th percentile, as adopted in Decision 26/3.

Water Typology	Coastal waters			
	Reference conditions of <i>c</i> (Chl <i>a</i>) (µg/L)		Boundaries of <i>c</i> (Chl <i>a</i>) (µg/L) for G/M status	
	<i>G</i> mean	90% percentile	<i>G</i> mean	90% percentile
Type I	1.19	3,33 ^b	4.1	10 ^b
Type I Adriatic	1,40	3,94	5,0 ^a	14,1
Type II-A-FR-SP ^d	0.78 ⁹	1,9	1.48	3.50 ¹⁰

⁹ Gmean values corresponding to the reference and boundary values of Chl*a* (expressed as the 90th percentile) are provided for Type II A FR SP and Type III W FR SP, along with the corrected calculation of Gmean value for Type I, compared to those included in Decisions IG.22/7 and IG.26/3, shown in blue shaded cells.

¹⁰ The value of 3.58 µg/L is corrected to 3.50 µg/L for Type II A FR SP in comparison to the values provided in Decision IG.22/7 on Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria (COP 19, 2016) and Decision IG.26/3 on 2023 MED QSR and a Renewed Ecosystem Approach Policy in the Mediterranean (COP 23, 2023), following the identification of an error by the Joint Meeting of CorMon on Pollution and Marine Litter Monitoring held on 27–28 May 2025 in relation to the boundary values used in the 2023 MED QSR.

Indicator Title		Common Indicator 14. Chlorophyll <i>a</i> concentration in water column (EO5)			
	Type II-A Adriatic	0,33	0,87	1,5	4,0
	Type II-A ^e Tyrrhenian	0,32	0,77	1,2	2,9
	Type III-W Adriatic ^c	-	-	0,64 ^f	1,7 ^f
	Type III-W Tyrrhenian	-	-	0,48	1,17
	Type III-W-FR-SP	0.37	0,9	0.74 ^f	1.89 ¹¹
	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					
Water Typology	Reference conditions of <i>c</i>(Chl<i>a</i>) (µg/L)		Boundaries of <i>c</i>(Chl<i>a</i>) (µg/L) for G/M status		
	<i>G</i> <i>mean</i>	90 % percentile	<i>G</i> <i>mean</i>	90 % percentile	
	Type I Adriatic	0,15 ^g ; 0,29 ^h	0,42 ^f ; 0,81 ^g	3,1	8,7
	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 Gulf 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 Chl*a* 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-Ac 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 Chl*a* 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 Chl*a* and DIN could not be proposed.

The geometric mean (*Gmean*) calculation procedure assumes the lognormal distribution of chlorophyll *a* data:

$$\text{Chl-}a \text{ 90th percentile}_{(\text{expected})} = 10^{(\log_{10}(\text{Chl-}a \text{ } G\text{mean}) + 1.282 \text{ sd})}$$

where 1.282 is the value assumed by the standard normal variable *z_c* for which P(*z*>*z_c*)=10%.

In this context, the 90th percentile should not be considered a true alternative to the geometric mean, as it represents a percentile value derived from the same theoretical normal distribution of log-transformed chlorophyll *a* data, converted back into a number scale.

Regarding the standard deviation (SD) value, an analysis by Giovanardi et al. (2018) of long-term chlorophyll *a* data series—conducted in accordance with OECD recommendations (Vollenweider and Kerekes, 1982)—found that standard deviations of the log₁₀-transformed chlorophyll *a* sample distributions ranged from 0.30 to 0.35 across all water types. Specifically:

¹¹ The value of 1.80 µg/L is corrected to 1.89 µg/L for type III W FR SP in comparison to the values provided in Decisions IG.22/7 and Decision IG.26/3, following the identification of an error by the Joint Meeting of CorMon on Pollution and Marine Litter Monitoring held on 27–28 May 2025 in relation to the boundary values used in the 2023 MED QSR.

Indicator Title	Common Indicator 14. Chlorophyll <i>a</i> concentration in water column (EO5)
- For Type I, SD is approximately 0.35. - For Type II Adriatic and Type III W Adriatic, SD is around 0.33. - For Type II Tyrrhenian and Type III W Tyrrhenian, SD is about 0.30. Developments within the European MSFD with regard to eutrophication should also be taken into account. It has to be noted that the Mediterranean countries are using different eutrophication non-mandatory assessment methods such as TRIX, UNTRIX, Eutrophication scale, EI, HEAT, OSPAR, etc. These tools are very important to continue to be used at sub-regional or national levels because there is a long-term experience within countries which can reveal / be used for assessing eutrophication trends. As part of the preparation for the 2023 MED QSR, the most relevant and applicable methods for eutrophication assessment were explored, developed, and applied, as outlined in the following section. Further advancements in eutrophication assessment should address the gaps identified during the 2023 MED QSR process. Ongoing efforts focus on establishing the new reference and boundary values for Total Phosphorus (TP) and Dissolved Inorganic Nitrogen (DIN), and the updated reference and boundary values, where applicable, for Chlorophyll <i>a</i> (Chl <i>a</i>), in the selected pilot sub-region(s)/sub-division(s), depending on data availability to enhance coherency and comparability of eutrophication assessment methodologies.	
Assessment of Eutrophication GES thresholds and trends are recommended to be used in a combination, depending on data availability and agreement on GES threshold levels. Within the framework of UNEP/MAP MED POL there is existing experience in applying the quantitative thresholds. As outlined in Targets section above, it is proposed that for the Mediterranean region quantitative thresholds between “good” (GES) and “moderate” (non-GES) conditions for coastal waters be established and applied for assessment of eutrophication in the 2023 MED QSR. According to the conclusions of the 2022 Meeting of the Ecosystem Approach Correspondence Group on Pollution Monitoring, the classification scheme rely on boundary and reference values of chlorophyll <i>a</i>, Dissolved Inorganic Nitrogen (DIN) and Total Phosphorous (TP) concentrations in coastal waters as these parameters are easily applicable by all Mediterranean countries For the eutrophication assessment conducted as part of the preparation of the 2023 MED QSR, different assessment methodologies were employed for the evaluation of CIs 13 and 14, based on the data availability provided by the Contracting Parties (CPs) across the four Mediterranean Sub-regions. The Mediterranean Sea is divided into four main sub-regions based on available database sources to facilitate the development of pollution assessment criteria. This process began with the preparation of the UNEP/MAP 2011 Initial Integrated Assessment, followed by the Med QSR 2017, and most recently, the 2023 MED QSR assessments. These sub-regions are: the Western Mediterranean, the Adriatic Sea, the Central Mediterranean, and the Aegean and Levantine Seas. An integrated NEAT GES assessment for CIs 13 and 14 across all sub-regions was not feasible due to the high heterogeneity of data types, spatial coverage, and the lack of quality-assured, homogeneous data. As a result, the NEAT methodology was applied to the Adriatic Sea Sub-region, based on the monitoring areas defined by the concerned CPs and the harmonization of scale approaches among the Contracting Parties. In the absence of reported <i>in situ</i> data for the Western, Central Mediterranean, and Aegean and Levantine Seas Sub-regions, satellite-derived data on Chlorophyll-<i>a</i> concentrations from COPERNICUS, ARGANS France, and the SMED algorithm were used as substitutes. The NEAT assessment methodology strikes a balance between overly broad scales, which may obscure significant areas of impact in specific regions or sub-regions, and excessively fine scales, which could complicate the assessment process. This methodology was applied at the IMAP CIs 13	

Indicator Title	Common Indicator 14. Chlorophyll <i>a</i> concentration in water column (EO5)
and 14 level for TP, DIN, and Chlorophyll-<i>a</i> as mandatory parameters. Other parameters were excluded due to the lack of data reported by the Contracting Parties. The 4-level nesting approaches were implemented in the Adriatic Sea Sub-region. This resulted in the aggregation and integration of assessment results within the IMAP nested scheme at the following levels: 1. IMAP national Spatial Assessment Units (SAUs) and sub-SAUs (the finest level) 2. IMAP coastal and offshore assessment zones of sub-divisions 3. Sub-division and sub-regional levels (e.g., Adriatic Sea). For setting the IMAP assessment areas for CIs 13 and 14, the finest areas defined for CI 17 were adjusted to serve the purpose of eutrophication assessment. Additionally, a GIS layer was created to show the distribution of water classes within the coastal and offshore zones. The scope of all SAUs and sub-SAUs was defined and introduced into the NEAT tool, along with their respective codes and surface areas (in km²). Within each SAU, under ‘habitats,’ the water types are introduced, and under ‘ecosystem component,’ the three measured parameters (DIN, TP, and Chlorophyll-<i>a</i>) are assigned. Data elaboration was carried out for the surface layer, as it represents the primary layer of eutrophication impact. Freshwater inputs are the main pressure drivers and largely contribute to the stratification of the water column, confining newly introduced nutrients to the surface layer. For the application of the NEAT software, data were grouped by parameter, ecosystem, and SAU. Average concentrations (geometric means), along with the geometric standard deviation and standard error of the geometric means, were calculated for the respective groups. While arithmetic means and standard errors were used for CI 17, geometric means and standard errors were applied for CIs 13 and 14. Boundary limits and class threshold values per SAU, parameter, and matrix are applied according to the assessment scale presented in the section on targets. The aggregation of TP, DIN, and Chlorophyll-<i>a</i> was carried out to derive a single status value (NEAT value) for all levels of the nesting scheme. The aggregation of the assessment results for these three parameters resulted in a NEAT value per specific SAU, which was then spatially integrated into the sub-divisions and regional levels. The assessment results were presented and visualized using a tabular format and graphical representations generated with a GIS tool. For sub-regions and sub-divisions where, insufficient data was reported for applying the NEAT GES assessment methodology across nested assessment areas, three alternative methodologies were developed for eutrophication assessment: 1. Ecological Quality Ratio (EQR) methodology 2. Simplified EQR methodology 3. Simplified Good/Moderate (G/M) comparison methodology. The EQR methodology was found relevant for assessing IMAP Common Indicators 13 & 14, where a full set of assessment criteria for Chlorophyll-<i>a</i> (Chl_a), Dissolved Inorganic Nitrogen (DIN), and Total Phosphorus (TP) exists. EQR is a dimensionless measure that compares the observed value of a measured parameter against reference conditions. The ratio ranges from 0 (large deviation) to 1 (equal to or better than reference conditions). EQR must be calculated for each boundary value, and a typology-based assessment must be conducted. However, due to the lack of data reported by Contracting Parties, this methodology could not be applied in the preparation of the 2023 Mediterranean Quality Status Report (MED QSR). The Simplified EQR methodology was deemed relevant when complementary data (in situ and remote sensing) was available for Chl_a only, but typology-based assessment could not be applied.	

Indicator Title	Common Indicator 14. Chlorophyll <i>a</i> concentration in water column (EO5)
However, due to the lack of homogeneous, quality-assured data reported by CPs—even for Chla alone—this methodology could not be applied to any sub-region or sub-division in the 2023 MED QSR, except for the Tyrrhenian Sea. Thresholds must be defined to determine the boundary between Good Environmental Status (GES) and non-GES. The Simplified G/M comparison methodology was used as an alternative to the NEAT GES Assessment, EQR, and Simplified EQR methodologies, relying solely on Chl-a data from remote sensing sources in cases where a typology-based assessment was not feasible. Data were aggregated as a 5-year geometric mean and normalized to ensure comparability across assessment areas. Normalization was conducted using the bestNormalize package in R. Each observation point or area was classified as GES or non-GES based on the assessment scale outlined in the Targets section. Further details are provided in the thematic eutrophication assessments and the 2023 MED QSR Pollution Assessment.	
Known gaps and uncertainties in the Mediterranean Further to the significant progress achieved over the last few biennia regarding the standardizing monitoring practices and establishing Good Environmental Status (GES) and environmental assessment tools—along with the improved availability of assessment criteria – it is essential for a complete assessment of eutrophication and the achievement of GES, to define GES thresholds and reference conditions (natural background concentrations) not only for chlorophyll <i>a</i>, but also for total phosphorus (TP) and dissolved inorganic nitrogen (DIN) across all sub-regions. This should build on the relevant experience gained in setting reference and boundary values for these nutrients in the Adriatic Sea Sub-region as minimum requirements. This process should include quality assurance schemes, as well as data quality control protocols. By building on the achievements up to 2023, during the preparation of the 2023 MED QSR, several knowledge gaps were identified in the monitoring and assessment of Common Indicators 13 and 14, which need to be addressed following the recommendations of the 2023 MED POL Focal Points Meeting. <u>Improve the availability of the assessment criteria for CIs 13 and 14:</u> Upon setting the reference conditions and boundary values for DIN and TP in the Adriatic Sea Sub-region, actions need to be undertaken to improve the availability of the assessment criteria for nutrients in the AEL, the CEN and the WMS Sub-regions. To that purpose the three continuous years of monitoring need to be provided with a minimum monthly frequency for Water types I and II and bimonthly to seasonal for Type 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. Further update of the assessment criteria for CI 14 should be undertaken as appropriate. The specific knowledge needs to be also built regarding the use of statistical tools for data validation and calculation of the assessment criteria. <u>Improve the GES assessment:</u> Further to the above elaborated common measures, the GES assessment for CIs 13 & 14 needs to be also improved, including the use of the remote sensing and modelling tools to complement <i>in situ</i> monitoring and adding additional sub-indicator i.e., the satellite-derived Chla data for GES assessment. <u>Upgrade present policy measures:</u> For the development of the adaptive eutrophication management strategies, the following specific actions should also be undertaken:	

Indicator Title		Common Indicator 14. Chlorophyll <i>a</i> concentration in water column (EO5)
		○ Extend the scope of research and monitoring programs to characterize the effects of eutrophication; ○ Implement regulations to mitigate inputs of nutrient to the marine environment, such as standards, technology requirements, or pollution caps for various sectors. ○ Preserve and restore natural ecosystems that capture and cycle nutrients.
Contacts and Version Date		
http://www.unepmap.org		
Version No	Date	Author
V.1	31.5.17	MEDPOL
V.2	10.1.19	MEDPOL
V.3	31/05/2019	Approved by the Meeting of MED POL FPs
Final version	09/09/2019	Approved by the 7 th Meeting of EcAp Coordination Group
V4	28/05/2025	Joint CorMon Pollution and ML Meeting
V5		Approved by the Meeting of MED POL FPs
Final version		Approved by the 12 th Meeting of EcAp Coordination Group

3. Guidance Factsheet on IMAP Common Indicators 17, 18, 20 and 21

8. The revision of IMAP **Common Indicator 17 (EO9)**: “Concentration of key harmful contaminants measured in the relevant matrix” is presented in the table below.

Indicator Title	Common Indicator 17. Concentration of key harmful contaminants measured in the relevant matrix (EO9)	
Relevant GES definition	Related Operational Objective	Proposed Target(s)¹²
Level of pollution is below a determined threshold defined for the area and species	Concentration of priority contaminants is kept within acceptable limits and does not increase	State: • Concentrations of specific contaminants below either the boundary limit between GES and non-GES classes of the assessment scales or below reference concentrations (from other sources). • No increasing trends in contaminants concentrations in sediment and biota from human impacted areas, statistically defined. Pressure:

¹² Following the decisions to be made at the present meeting regarding minor adjustments to the Targets, as outlined in working document UNEP/MED WG.626/3, the revised Targets will be incorporated into the revised IMAP Pollution Indicators Factsheets.

Indicator Title	Common Indicator 17. Concentration of key harmful contaminants measured in the relevant matrix (EO9)	
		• Reduction of contaminants emissions from land-based sources.
Rational		
Justification for indicator selection		
Chemicals are everywhere in our daily life and play a fundamental role in most of our activities, as they form part of virtually every device, we use to ensure our well-being, protect our health and security, and meet new challenges through innovation. Chemicals are also the building blocks of low-carbon, zero pollution and energy- and resource-efficient technologies, materials and products. The increased investment and innovative capacity of the chemicals industry to provide safe and sustainable chemicals will be vital to offer new solutions and support both the green and the digital transitions of our economy and society.¹³		
Environmental chemical pollution is directly linked with humankind activities in all the earth's ecosystems. Marine environmental investigations have detected thousands of man-made chemicals (both inorganic and organic compounds) all over the world oceans, which have been shown to impair the health of the marine ecosystems and their ecosystem services. The study of the occurrence, transport, transformation and fate, through the different ecosystem compartments (seawater column, marine biota, sediment, etc.), as well as the study of their sources and entry routes (land-based, sea-based (marine) and atmospheric wet and dry deposition) are the first steps to assess the pressures, state and impact to the environment understand and to decide further management actions for a growing environmental problem. Currently, new man-made chemicals and emerging pollutants continue to enter the marine environment and interact with the different marine species, habitats and ecosystems (coastal, open ocean, deep-sea areas), increasing the complexity of the chemical pollution threats for the marine environment and their future sustainability to deliver its benefits. The monitoring and assessment of the harmful and noxious substances occurrence, at selected spatial and temporal scales, will determine either a chronic or acute contamination/pollution scenarios.		
Hazardous chemicals and their complex interaction with other environmental stressors can have long-term and large-scale environmental impacts on the terrestrial and marine environment. They can contribute to the reduction of ecosystem resilience, leading to rapid declines in animal populations and, ultimately, to extinctions, as well as impacting human health and wellbeing, not least through the possible presence of contaminants in the food chain. It is estimated that 2.8 million potentially contaminated sites exist in the EU, mainly from waste disposal and treatment, posing a significant environmental hazard for terrestrial and aquatic ecosystems and affecting the productivity of soils. The current regulatory and policy framework struggles to take this into account and needs to be strengthened.¹⁴		
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¹³ Chemicals Strategy for Sustainability Towards a Toxic-Free Environment, European Commission, COM(2020) 667 final

¹⁴ Chemicals Strategy for Sustainability Towards a Toxic-Free Environment, European Commission, COM(2020) 667 final

Indicator Title	Common Indicator 17. Concentration of key harmful contaminants measured in the relevant matrix (EO9)
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Policy Context and Targets	
Policy context description	
In most Mediterranean countries, the monitoring of a range of hazardous chemical substances in different marine compartments are undertaken in response to the UNEP/MAP Barcelona Convention (1976) and its Land-Based Protocol, through the coordination of the UNEP/MAP MED POL Monitoring Program. For Mediterranean EU Countries, the European legislation on the Marine Environment also applies (e.g. EU WFD and EU MSFD), as well as other international and national policy drivers. A considerable amount of founding knowledge and actions are available through the pollution monitoring and assessment component of the UNEP/MAP MED POL Programme during the past decades until today. The environmental assessments have been used for the identification and confirmation of significant marine contaminants occurrence, distributions, levels and trends; as well as, for the continuous development of monitoring strategies and guidance. With respect to the Ecosystem Approach and IMAP, their implementation continue under the benefits gained from this past knowledge and the policy and practical framework built in the Mediterranean Sea. In the context of the Mediterranean Sea, the monitoring and assessment of contaminants were redefined in accordance with the Integrated Monitoring and Assessment Programme (UNEP/MAP, 2016). This redefinition also ensures synergy with the European Marine Strategy Framework Directive (200/56/EC). The Data Dictionaries and Standards for IMAP Common Indicator 17 (2019, http://imapinfosystem.info-rac.org/app/#/standard), aligned with the IMAP Guidance Factsheets, defined the list of mandatory datasets, including physico-chemical parameters, to provide an integrated assessment of contaminants in the Mediterranean.	
Targets	

Indicator Title	Common Indicator 17. Concentration of key harmful contaminants measured in the relevant matrix (EO9)				
conditions (Bad). Additionally, a threshold value is set to distinguish between Good Environmental Status (GES) and non-GES conditions. - The decision rule for determining GES/non-GES status is based on comparing CHASE+ score values against the threshold (xBAC), which distinguishes the Good and Moderate classes. For trace elements, the GES/non-GES threshold is 1.5 BACs. For organic contaminants, the GES/non-GES threshold is 2 BACs. - The Moderate/Poor boundary is set at 2 × BAC, and the Poor/Bad boundary is set at 5 × BAC. - CHASE+ values range from 0 to 5 and above, representing the overall contamination status of a station or area based on the Contamination Ratio (CR) or Contamination Score (CS). - The GES/non-GES boundary is set at a CHASE+ score of 1, meaning only values equal to or below (x BAC) set as the GES/non GES threshold are considered GES. This classification aligns CHASE+ with the NEAT assessment methodology. - Contamination Ratio (CR) is calculated as the ratio C_measured / C_threshold for each contaminant measured in a specific matrix (biota or sediment). - Contamination Score (CS) is the simple average of CR values, providing an aggregated assessment of contaminants per matrix and station. - The decision rule states that a station is considered GES if at least 75% of the elements assessed are within GES limits. The same rule applies when assessing area.					
CHASE+ Assessment of CI 17	GES		non-GEs		
	High	Good	Moderate	Poor	Bad
Boundary Limits	0< meas. conc. ≤ BAC	BAC<meas. conc. ≤GES/nGES threshold	GES/nGES<meas. conc. ≤ moderate/poor threshold	moderate/poor threshold <mean. conc. ≤ max. conc.	
CHASE+ scores	0 <CR,CS ≤0.5	0.5<CR,CS≤ 1	1<CR,CS ≤ 2	2< CR,CS ≤5	CR,CS> 5
Thresholds	½ (xBAC)		(xBAC)	2 (xBAC) ∞	5 (xBAC) ∞

Policy documents

General Policy documents

Decision IG.21/3 (COP18,2013) on Ecosystems Approach including adopting definitions of Good Environmental Status (GES) and Targets (UNEP(DEPI)/MED IG.21/9).

Decision IG.22/7 (COP19, 2016) on - Integrated Monitoring and Assessment Programme (IMAP) of the Mediterranean Sea and Coast and Related Assessment Criteria (UNEP(DEPI)/MED IG.22/28).

Decision IG.25/1 (COP22, 2021) on UNEP/MAP Medium-Term Strategy 2022-2027.

Decision IG.22/7 (COP19, 2016) on the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria.

Decision IG.23/6 (COP20, 2017) on 2017 Mediterranean Quality Status Report.

Decision IG.24/4 (COP21, 2019) on Assessment Studies.

Decision 26/3 (COP23, 2023) on the 2023 Mediterranean Quality Status Report and a Renewed Ecosystem Approach Policy in the Mediterranean.

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Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (EU Marine Strategy Framework Directive and updates in 2010). Commission Directive (EU) 2017/845 amending Directive 2008/56/EC of the European Parliament and of the Council as regards the indicative lists of elements to be taken into account for the preparation of marine strategies Commission Decision (EU) 2017/848 laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardised methods for monitoring and assessment, and repealing Decision 2010/477/EU. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (and updated revisions). Commission Decision (EC) No 2013/480/EU establishing, pursuant to Directive 2000/60/EC of the European Parliament and of the Council, the values of the Member State monitoring system classifications as a result of the intercalibration exercise and repealing Decision 2008/915/EC. 2017 Mediterranean Quality Status Report, https://www.medqsr.org/node/10/ 2023 Mediterranean Quality Status Report, medqsr2023.info-rac.org UNEP(DEPI)/MED IG.22/Inf.7. (2016) Integrated Monitoring and Assessment Guidance Contaminants related Policy documents EEA, 1999 State and pressures of the marine and coastal Mediterranean environment. Environmental issues series n°5. European Environmental Agency, Copenhagen, 1999. http://www.eea.eu.int EEA, 2003. Hazardous substances in the European marine environment: Trends in metals and persistent organic pollutants. Topic Report 2/2003. EEA, European Environmental Agency, Copenhagen, 2003. http://www.eea.eu.int EEA, 2018. European Waters – Assessment of status and pressures 2018. EEA Report /No 7, 2018. European Commission, E. (2018) Guidance Document No: 27. Technical Guidance For Deriving Environmental Quality Standards.EU Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). EU Regulation on the Classification, Labelling and Packaging of hazardous substances (CLP). OSPAR (2008) Co-ordinated Environmental Monitoring Programme (CEMP) Assessment Manual for contaminants in sediment and biota. OSPAR Commission No. 379/2008. OSPAR Commission, 2013. Levels and trends in marine contaminants and their biological effects - CEMP Assessment Report 2012. Monitoring and Assessment Series, 2013 OSPAR 2017. https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/pressures-human-activities/contaminants/ UNEP(DEPI)/MED WG.365/Inf.5. Analysis of the trend monitoring activities and data for the MED POL Phase III and IV (1999-2010). Consultation Meeting to Review MED POL Monitoring Activities. Athens, 22-23 November 2011. UNEP/MAP MED POL – Phase III, Programme for the Assessment and Control of Pollution in the Mediterranean Region. MAP Technical Report Series No. 120, UNEP, Athens, 1999. UNEP/MAP, 2005. Fact sheets on Marine Pollution Indicators. Meeting of the UNEP/MAP MED POL National Coordinators. Barcelona, Spain, 24-27 May 2005. UNEP (DEC)/MED/ WG.264/ Inf.14. UNEP, Athens.	

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UNEP/MAP WG.509/24 (2021). Monitoring Guidelines/Protocols for Sample Preparation and Analysis of Marine Biota for IMAP Common Indicator 17: Heavy and Trace Elements and Organic Contaminants. Meeting of the MED POL Focal Points, Videoconference, 6-7 October 2021.	
UNEP/MAP WG.509/25 (2021). Monitoring Guidelines/Protocols for Sampling and Sample Preservation of Seawater for IMAP Common Indicator 17: Heavy and Trace Elements and Organic Contaminants. Meeting of the MED POL Focal Points, Videoconference, 6-7 October 2021.	
UNEP/MAP WG.509/26 (2021). Monitoring Guidelines/Protocols for Sample Preparation and Analysis of Seawater for IMAP Common Indicator 17: Heavy and Trace Elements and Organic	

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Contaminants. Meeting of the MED POL Focal Points, Videoconference, 6-7 October 2021. UNEP/MAP WG.492/10/ Rev.2 (2021). Integration and Aggregation Rules for Monitoring and Assessment of (IMAP Pollution and Marine Litter Cluster). Meeting of the Ecosystem Approach Correspondence Group on Pollution Monitoring, Videoconference, 26-28 April 2021. UNEP/MAP WG. 533/Inf.3 (2022). Adjusted Background (Assessment) Concentrations (BC/BAC) for Common Indicator 17 and Upgraded Approach for Environmental Assessment Criteria (EAC) for IMAP Common Indicators 17, 18 and 20	
Indicator analysis methods	
Indicator Definition	
Concentrations of key contaminants in the following matrices (note this is a multiparameter pressure indicator): MARINE BIOTA: In collected marine organisms, where whole soft tissues or dissected parts, following the analytical procedure detailed in the Monitoring Guidelines for CI 17, are processed according sampling and sample preparation protocols, and primarily, in bivalve species and/or fish the following hazardous substances should be measured as mandatory, as agreed upon at the 2017 Meeting of MED POL Focal Points and further elaborated during the preparation of Data Standards for CI 17 ○ Trace/Heavy Metals (TM): Mercury and its compounds (Hg), Cadmium and its compounds (Cd), Lead and its compounds (Pb), and Copper and its compounds; Organochlorinated compounds: PCB congeners: 28, 52, 101, 118, 138, 153, 180, 105 and 156; Σ 7PCBs (28, 52, 101, 118, 138, 153, 180); Hexachlorobenzene, Gamma-HCH Lindane and ΣDDTs (DDT, p,p' + DDT, o,p' + DDE, p,p' + DDD, p,p'); ○ 16 Polycyclic Aromatic Hydrocarbons (PAHs): Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, Dibenz[a,h]anthracene, Fluoranthene, Fluorene, Indeno(1,2,3-cd)pyrene, Naphthalene, Phenanthrene, Pyrene, along with total Σ16 PAHs; The lipid content and flesh fresh/dry weight ratio should be measured in biota for normalisation and reporting purposes. MARINE SEDIMENTS: In coastal and marine areas, continental platform and offshore, sediments should be collected by mechanical means and processed at the laboratory (< 2 mm particle size fraction), following the analytical procedure detailed in the Monitoring Guidelines for CI 17. Further the following hazardous substances should be measured as mandatory, as agreed upon at the 2017 Meeting of MED POL Focal Points and further elaborated during the preparation of Data Standards for CI 17: ○ Trace/Heavy Metals (TM): Mercury and its compounds (Hg), Cadmium and its compounds (Cd), Lead and its compounds (Pb), and Copper and its compounds; Organochlorinated compounds; PCB congeners: 28, 52, 101, 118, 138, 153, 180, 105 and 156; Σ 7PCBs (28, 52, 101, 118, 138, 153, 180); aldrin; dieldrin; Hexachlorobenzene; Gamma-HCH Lindane and ΣDDTs (DDT, p,p' + DDT, o,p' + DDE, p,p' + DDD, p,p'); ○ 16 Polycyclic Aromatic Hydrocarbons (PAHs): Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, Dibenz[a,h]anthracene, Fluoranthene, Fluorene, Indeno(1,2,3-cd)pyrene, Naphthalene, Phenanthrene, Pyrene, along with total Σ16 PAHs;	

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Following the analytical procedure detailed in the Monitoring Guidelines for CI 17, the aluminium (Al), Total Organic Carbon (TOC) in the < 2mm particle size fraction should be performed for normalization and reporting purposes for TM and OCs, respectively. The < 63µm sediment fraction is also recommended to be complementary for metals. The liophilization ratio (dry/wet sediment ratio) should be considered for datasets reporting. SEAWATER: the monitoring and assessment of contaminants in seawater samples collected in coastal, marine and open-sea areas presents specific challenges and higher costs. For the mid/long-term monitoring programmes, such as IMAP, these are recommended to be carried out on a country decision basis. The analytical procedure is detailed in the Monitoring Guidelines for CI 17. Sub-indicators: other relevant mandatory chemicals are elaborated in Data Standards for IMAP CI 17, whereby emerging pollutants are recommended to be monitored based on the availability of relevant scientific knowledge and research, and accordingly proposed for decision making by the Contracting Parties. Data Standards for CI 17 include the reporting of a long list of non-mandatory parameters concerning the decision of the national IMAP competent authorities. Methodology for indicator calculation Trace/Heavy Metals (TM) and Aluminium: Spectrometry, Mass Spectrometry Organic compounds: Gas or Liquid Chromatography (GC/LC) coupled to a variety of detectors, such as Electron Capture Detectors or Mass Spectrometry, atomic adsorption. The list of all chemical and related parameters subject to reporting for IMAP CI 17 by the Contracting Parties is elaborated in the Data Standards for IMAP CI 17. ○ The detailed analytical procedure for the above chemicals and other related mandatory parameters, including sampling and sample transportation, analytical determination of indicators and sub-indicators, data quality control are outlined in: B-1. Monitoring Guidelines/Protocols for sampling and analysis of contaminants in sediment. ○ B-2. Monitoring Guidelines/Protocols for sampling and determination of contaminants in marine biota. ○ B-3. Monitoring Guidelines/Protocols for sampling and analysis of contaminants in seawater.	
Indicator units Trace/Heavy Metals (TM) and Aluminium: mass/dry or wet weight mass of sample according to Data Standards for CI 17. The dry/wet mass ratios should be calculated and reported. Organic compounds (OCs): mass/dry or wet weight mass of sample according according to Data Standards for CI 17. The dry/wet mass ratios should be calculated and reported. Data Standards for IMAP CI 17 elaborates units for other relevant mandatory chemicals and parameters.	
List of Guidance documents and protocols available	

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IMAP Monitoring Guidelines/Protocols (https://www.iaea.org/about/organizational-structure/department-of-nuclear-sciences-and-applications/division-of-iaea-environment-laboratories/marine-environmental-studies-laboratory/unep-map-med-pol-integrated-monitoring-and-assessment-programme-imap-monitoring-guidelines) ○ B-1. Monitoring Guidelines/Protocols for sampling and analysis of contaminants in sediment. ○ B-2. Monitoring Guidelines/Protocols for sampling and determination of contaminants in marine biota. ○ B-3. Monitoring Guidelines/Protocols for sampling and analysis of contaminants in seawater. ○ E-1. Monitoring Guidelines/Protocols for Analytical Quality Assurance for IMAP Common Indicators 13, 14, 17, 18 and 20; ○ F-1. Monitoring Guidelines/Protocols for Reporting Monitoring Data for IMAP Common Indicators 13, 14, 17, 18 and 20.	
Data Confidence and uncertainties The implementation of IMAP provided scientific evidence of significant variations between the four Mediterranean sub-regions, therefore values of BCs/BACs at the sub-regional level were initially introduced in 2019 and furthermore elaborated in the period in the period 2020-2022. The frequency of analyzing one sample of either biota or sediment within proficiency testing organized in collaboration of UNEP/MAP-MEDPOL and IAEA-MESL is insufficient for calculation of the precision of monitoring data. Therefore, the further update of the regional and sub-regional BCs/BACs values for the Mediterranean was completed in 2022 using new data sets reported by the countries, and by applying certain adjustments to the methodology already used in 2016 and 2019 (UNEP/MED WG365/Inf.8 (2011); UNEP/MED WG.533/Inf.3; UNEP/MED WG.533/3). Selected analytical methods and measurements are subject to internal Quality Assurance through National Laboratories QA/QC Protocols and Laboratory accreditations, as well as external Quality Assurance by performing regional interlaboratory QA/QC exercises organized in collaboration of the UNEP/MAP - MED POL and the IAEA/MESL since 1986. . Uncertainties in marine data measurements are identified at different levels (cumulative): analytical level (by use of Certified Reference Materials), reporting level (by providing averaged values and the associated uncertainties), database flagging level (primarily according the analytical and reporting compliance, number of non-detected values and levels, fulfilment of the QA/QC Protocols and Interlaboratory Exercises). Up to 2023, the IAEA/MESL, in collaboration with the UNEP/MAP - MED POL, implemented 56 interlaboratory comparisons/proficiency tests for the analysis of trace elements and organic contaminants, as well as 64 training courses on the analysis of trace elements and organic contaminants in marine samples. Over 370 analytical laboratory practitioners have been trained at MESL. As of 2018, the scope of proficiency testing and training courses has been adjusted to meet the needs of Mediterranean laboratories in implementing monitoring programmes for trace elements (covering mandatory heavy metals – Cd, Hg, Pb, Cu in line with IMAP requirements, as well as additional elements such as Al, As, Co, Cr, Fe, Li, Mn, Ni, and Zn) and organic contaminants for IMAP Common Indicator 17 (covering mandatory organic contaminants including organochlorine (OC) pesticides, polychlorinated biphenyl congeners (PCBs), and polycyclic aromatic hydrocarbons (PAHs), also in accordance with IMAP requirements). Designated national laboratories participating in the proficiency tests receive, along with the sample, clear instructions on how to proceed with the PT sample and how to report the results. They are requested to use established analytical methods and are recommended to apply quality control and laboratory quality assurance	

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procedures. The results of analyses of a matrix-matching quality control (QC) sample must be reported along with the results from the PT sample. As of 2024, the scope of proficiency testing and training courses has been expanded to support the capacities of national laboratories in monitoring eutrophication (IMAP Common Indicators 13 & 14: inorganic nutrients in high salinity seawater, in estuarine and low salinity seawater, and chlorophyll a and Phaeopigments in Seawater) and contaminants in seafood (IMAP Common Indicator 20: heavy metals including the mandatory heavy metals – Cd, Hg, Pb, Cu, as well as additional elements such as Al, As, Co, Cr, Fe, Li, Mn, Ni, and Zn as specified for CI 17, polycyclic aromatic hydrocarbons (PAHs), dioxins, and PCBs). In addition, the data quality control range categories were initially established for physic-chemical parameters related to the monitoring of IMAP Common Indicators 13 and 14, as well as for contaminants related to the monitoring of Common Indicator 17, by applying relevant statistical methods and available scientific expertise in ensuring the quality of data reported to the IMAP Info System. These data control categories have been integrated into the IMAP Info System as of 2024.	
Methodology for monitoring, temporal and spatial scope	
Available Methodologies for Monitoring and Monitoring Protocols In line with the Ecosystem Approach and the IMAP implementation, there are considerable benefits to be gained from taking advantage of previous knowledge and information developed through the UNEP/MAP-MED POL. These actions include (1) the use of existing experience in the design of monitoring programmes, (2) the use of existing guidance on sampling and analytical methods to inform technical aspects of ecosystem approach monitoring, (3) the use of existing sampling station networks as a framework for the ecosystem approach monitoring networks, (4) the use of existing statistical assessment tools and work on assessment criteria as the basis for the assessments of ecosystem approach data, (5) the use of existing data to describe the distributions and levels of contaminants against EACs and reference concentrations, and (6) the use of existing time series as the basis of monitoring against a “no deterioration” target. The availability of quality assured data is of importance for the assessment of trends and levels and their comparability overtime and across spatial scales. Building on elements elaborated in the Integrated Monitoring and Assessment Programme (2016 IMAP), including the above-mentioned components, the Monitoring Guidelines—structured around the specific technical protocols related to IMAP Common Indicator 17—were comprehensively developed by the MED POL Programme in cooperation with IAEA/MESL. These guidelines were approved by the MED POL Focal Points Meeting (2021). They build upon the knowledge and practices obtained over 40 years of MED POL monitoring implementation and recent publications, highlighting the current practices of the Contracting Parties’ marine laboratories, as well as other Regional Seas Conventions and the EU. A thorough analysis of presently available practices of UNEP/MAP, UNEP and IAEA, as well the HELCOM, OSPAR and European Commission Joint Research Centre was undertaken to assist an innovative approach for preparation of the IMAP Monitoring Guidelines/Protocols. The monitoring methodologies and practices are elaborated for sampling, sample preservation and transportation, sample preparation and analysis, along with quality assurance and reporting of monitoring data, for their use by the IMAP competent laboratories in order to ensure the representativeness and accuracy of the analytical results. These guidelines present a summary of the best available known practices employed in marine monitoring by bringing integrated comprehensive analytical practices that can be applied in order to ensure the representativeness and accuracy of the analytical results needed for generation of quality assured monitoring data. The Monitoring Guidelines for IMAP Common Indicator 17 outline the following monitoring and reporting practices:	

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○ B-1. Monitoring Guidelines/Protocols for sampling and analysis of contaminants in sediment; ○ B-2. Monitoring Guidelines/Protocols for sampling and determination of contaminants in marine biota; ○ B-3. Monitoring Guidelines/Protocols for sampling and analysis of contaminants in seawater; ○ E-1. Monitoring Guidelines/Protocols for Analytical Quality Assurance for IMAP Common Indicators 13, 14, 17, 18 and 20; ○ F-1. Monitoring Guidelines/Protocols for Reporting Monitoring Data for IMAP Common Indicators 13, 14, 17, 18 and 20.	
Available data sources i. IMAP Info System (http://imapinfosystem.info-rac.org/app/#/) ii. EMODNET Chemistry: http://www.emodnet-chemistry.eu/data_access.html Additional potential data sources: ○ The scientific literature providing data on no effect or adverse biological effects alongside chemical data from the environment and biota at the same site and time. ○ The studies providing sediment toxicity tests, aquatic toxicity tests in conjunction with equilibrium partitioning (EqP), and field and mesocosm studies from relevant scientific sources in consultation with the national counterparts. The selected studies should include all relevant auxiliary information: citation, type of test, type of biological effect, analytical approach used, study area, test duration, species tested or the benthic community considered, TOC, Acid volatile sulphide (AVS), chemical concentrations, among others.	
Spatial scope guidance and selection of monitoring stations The spatial scope for monitoring should include reference and coastal long-term master stations, including offshore, distributed spatially as relevant and include local spatial refinements, such as transect sampling (for sediment and/or active biomonitoring); and therefore, is a direct function of the risk-based assessments and the long-term monitoring purposes. The selection of the sampling sites for the monitoring of contaminants in the marine environment should consider: • Risk areas of concern identified on the basis of the review of the existing information. • Vulnerable areas of known past and/or present release of chemical contaminants. • Offshore areas where risk warrants coverage (aquaculture, offshore oil and gas activity, dredging, mining, dumping at sea and others). • Monitoring sites representative of other sources, such as shipping and atmospheric inputs. • Reference monitoring sites: to establish scale-based reference values and background concentrations. • Monitoring sites representing sensitive pollution sites/areas at national and sub regional scale. • Monitoring sites in deep-sea sites, offshore stations (sediments) and areas of potential particular concern. The selected sites should allow the collection of a realistic number of samples over the years (e.g. to be suitable for sediment sampling, to allow sampling a sufficient number of biota for the selected species during the duration of the programme). It is essential that the monitoring strategies are being coordinated at regional and/or sub regional level. The coordination with the monitoring networks for other Ecological Objectives is crucial for cost-effective and future IMAP integrated assessment.	

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As part of the 2023 MED QSR preparation, the assessment scales for CI 17 are defined within the framework of the IMAP nested approach, applying, among others, the above-listed criteria for the selection of the sampling sites, and building upon the elements outlined in the section on Assessment of Eutrophication.	
Temporal Scope guidance Sampling frequencies will be determined according the current status of the national marine monitoring. INITIAL PHASE OF IMAP MONITORING: to identify key sampling sites/stations within a coastal network which should include: BIOTA samples (bivalves, e.g. <i>Mytilus galloprovincialis</i>, as commonly agreed, mandatory IMAP species where present in local ecosystems, <i>Donax trunculus</i>, etc.), yearly collection, and fish (i.e. <i>Mullus barbatus</i>, as commonly agreed, mandatory IMAP species where present in local ecosystems) every 4 years. In this phase monitoring SEDIMENTS (coastal, offshore areas) should be collected every two years. ADVANCED PHASE OF IMAP MONITORING (when there is a fully completed IMAP Initial Phase of implementation with the ongoing data reporting) should include: BIOTA from 1 to 3 years according the trends and levels of chemicals assessed at the different stations/sites, and SEDIMENTS from 3 to 6 years depending on the characteristics of sedimentation areas and the chemical concerned known through previous assessments. The temporal scope may range from seasonally variable parameters up to large time scales, e.g. sediment core monitoring (years to decades). For temporal trend determinations the sampling frequencies will depend on the ability to detect trends considering the environmental and the analytical variability (ca. total uncertainty). It can be possible to decrease the sampling frequencies and target chemicals in cases where established time trends and levels show concentrations well below levels of concern, and without any upward trend over a number of years (including the stations/sites where recurrently exhibit non-detected contaminants value; that is below detection and quantification limits).	
Data analysis and assessment outputs	
Statistical analysis and basis for aggregation – Assessment Criteria Monitoring should allow the necessary statistical data treatments and long-term time-trend data analysis. 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).¹⁵ 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	

¹⁵Additional definitions for BC can be found in the literature and are explained in UNEP/MED WG.533/Inf.3

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2011),^{5F16} 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. 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.^{6F17} 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. 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. 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 Mediterranean and for the whole Mediterranean Sea, by using the same methodology as initially applied in 2016/2017 and replicated in 2019.¹⁸ 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). For Polycyclic Aromatic Hydrocarbons (PAHs) in sediments and mussel (<i>M. galloprovincialis</i>), BAC values were calculated as follows: MedBAC=1.5 x MedBC.¹⁹ 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. 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. 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 (<i>M. galloprovincialis</i>). As for sediments, data with BDL values	

¹⁶For 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.

¹⁷ 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.

¹⁸ 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).

¹⁹ 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.

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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.²⁰ This could be the one reason for the differences in BACs between sub-regions.

The Meeting of CorMon Pollution (1-2 March 2023) 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.

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.

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), and approved by Decision 26/3 (COP23, 2023) on the 2023 Mediterranean Quality Status Report and a Renewed Ecosystem Approach Policy in the Mediterranean, are presented here-below in Tables 1 to 5.

Table 1. 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 2. 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					
PAH compounds	Updated BC values (2022) in sediments, µg/kg dry wt				
	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) [#]	#	#	#	#

²⁰ See Annex III in UNEP/MAP WG.533/Inf 3.

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	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
	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 3. 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 (<i>M. galloprovincialis</i>), 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>

Indicator Title	Common Indicator 17. Concentration of key harmful contaminants measured in the relevant matrix (EO9)																																																																																
* 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 <i>M. galloprovincialis</i>, it was approved to use the values calculated in 2019.																																																																																	
<table><tr><th colspan="6">New updated BC and BAC values for trace metals in fish muscle (<i>Mullus barbatus</i>), µg/kg wet wt</th></tr><tr><th colspan="6">New updated BC values (2022)</th></tr><tr><th>TM</th><th>MED</th><th>WMS</th><th>ADR</th><th>CEN</th><th>AEL</th></tr><tr><td>Cd</td><td>3.9</td><td>*</td><td>5.3</td><td>*</td><td>3.6</td></tr><tr><td>Hg</td><td>40.6</td><td>*</td><td>120</td><td>*</td><td>33.7</td></tr><tr><td>Pb</td><td>18.3</td><td>*</td><td>40.8</td><td>*</td><td>13.5</td></tr><tr><th colspan="6">New updated BAC values (2022)</th></tr><tr><th></th><th>MED</th><th>WMS</th><th>ADR</th><th>CEN</th><th>AEL</th></tr><tr><td>Cd</td><td>7.8</td><td>*</td><td>10.6</td><td>*</td><td>7.2</td></tr><tr><td>Hg</td><td>81.2</td><td>*</td><td>240</td><td>*</td><td>67.4</td></tr><tr><td>Pb</td><td>36.6</td><td>*</td><td>81.6</td><td>*</td><td>27.0</td></tr></table> * 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		New updated BC and BAC values for trace metals in fish muscle (<i>Mullus barbatus</i>), 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														
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Table 4. New BC and BAC values for Polycyclic Aromatic Hydrocarbons (PAHs) in mussel (<i>M. galloprovincialis</i>) 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.																																																																																	
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New BC and BAC values for Polycyclic Aromatic Hydrocarbons (PAHs) in mussel (<i>M. galloprovincialis</i>), µg/kg dry wt																																																																																	
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²¹ 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,

Indicator Title	Common Indicator 17. Concentration of key harmful contaminants measured in the relevant matrix (EO9)			
	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;				

Table 5. 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 concentrations 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 (<i>M. galloprovincialis</i>)					
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	*	*

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.

Indicator Title		Common Indicator 17. Concentration of key harmful contaminants measured in the relevant matrix (EO9)					
	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							
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). 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.²² 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. 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 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. 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 6 to 8. 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							

²² 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.

Indicator Title	Common Indicator 17. Concentration of key harmful contaminants measured in the relevant matrix (EO9)																												
IG.22/7 with the sources originally used (i.e., Long et al., 1995, OSPAR, 2009. 23) The following slight updates are included in Decision 26/3 (COP23, 2023) on the 2023 Mediterranean Quality Status Report and a Renewed Ecosystem Approach Policy in the Mediterranean:																													
a) Table 6: The new EAC values were added for the following PAHs: i) Naphthalene; Acenaphthylene; Acenaphthene Fluorene; Dibenzo [a,h]anthracene and Sum16 PAHs in sediments and ii) Naphthalene in biota.																													
b) Table 7: 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. ²⁴ 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 6. Mediterranean EAC values for trace metals in sediments and biota, as endorsed by Decision IG.23/6																													
<table><tr><th colspan="4">Mediterranean EAC values for trace metals in sediments and biota</th></tr><tr><th rowspan="3">TM</th><th>MedEAC*</th><th>#MedEAC</th><th>#MedEAC</th></tr><tr><th>Sediments, µg/kg dry wt</th><th>M. galloprovincialis, µg/kg dry wt</th><th>Mullus barbatus, µg/kg wet wt</th></tr><tr><th>IG.23/6</th><th>IG.23/6</th><th>IG.23/6</th></tr><tr><td>Cd</td><td>1200</td><td>5000</td><td>50</td></tr><tr><td>Hg</td><td>150</td><td>2500&</td><td>1000</td></tr><tr><td>Pb</td><td>46700</td><td>7500</td><td>300</td></tr></table>				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
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																													
Table 7. 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																													

²³ 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.

²⁴ Table A.3.1:" ERL for ICES sum of 7CB is total CB concentration/2"

Indicator Title		Common Indicator 17. Concentration of key harmful contaminants measured in the relevant matrix (EO9)		
Mediterranean EAC values for Polycyclic Aromatic Hydrocarbons (PAHs) in sediments and biota				
	Sediments, µg/kg dw		Biota Mussels, µg/kg dw	
	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#
PAH compounds				
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 8. 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
	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)
PCBs					
CB28			1.7	3.2	64
CB52			2.7	5.4	108
CB101			3	6	120
CB118			0.6	1.2	24
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

Indicator Title		Common Indicator 17. Concentration of key harmful contaminants measured in the relevant matrix (EO9)			
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. Ongoing efforts focus on establishing an improved methodology for setting the Environmental Assessment Concentration (EAC) for IMAP Common Indicator 17 at the regional and the sub-regional level subject to data availability. These efforts also include proposing the new area-specific species, contaminants, and emerging contaminants of concern recommended to strengthen pollution monitoring in the Mediterranean. Assessment of Contaminants in sediments and biota For chemical contaminants, trends analysis and distribution levels for the assessment could be carried out on sub-regional and/or regional level, provided appropriate quality control assured datasets are available. For the assessment of contaminants in sediments and biota conducted as part of the preparation of the 2023 MED QSR, different assessment methodologies were employed for the evaluation of CI 17, based on the data availability provided by the Contracting Parties (CPs) across the four Mediterranean Sub-regions. The Mediterranean Sea is divided into four main sub-regions based on available database sources to facilitate the development of pollution assessment criteria. This process began with the preparation of the UNEP/MAP 2011 Initial Integrated Assessment, followed by the Med QSR 2017, and most recently, the 2023 MED QSR assessments. These sub-regions are: the Western Mediterranean, the Adriatic Sea, the Central Mediterranean, and the Aegean and Levantine Seas. An integrated NEAT GES assessment methodology was tested, and thereafter applied, first to the assessment of contaminants (CI 17), and then to chl_a (CI 13) and nutrients (CI 14) in the Adriatic Sea Sub-region. The integrated NEAT GES assessment for CI 17 across all sub-regions was not feasible due to the high heterogeneity of data types, spatial coverage, and the lack of quality-assured, homogeneous data. As a result, the NEAT methodology was applied to the Adriatic Sea Sub-region and later to the Western Mediterranean Sub-region, based on the monitoring areas defined by the concerned CPs and the harmonization of scale approaches among the Contracting Parties. For some subregions of the Mediterranean Sea, it was possible to define IMAP spatial assessment units (IMAP SAUs) based on the distribution of monitoring stations (e.g. Adriatic Sea, Western Mediterranean Sea), while for others with insufficient data reported for GES assessment this was impossible. A quality status assessment for all areas is needed either on a SAU level or alternatively on individual monitoring stations level. The NEAT methodology supports assessments in areas where SAUs are defined (e.g. Adriatic Sea; Western Mediterranean Sea). For areas where this is impossible, the CHASE+ (Chemical Status Assessment Tool) methodology was applied for assessment at the monitoring stations level. The NEAT assessment methodology strikes a balance between overly broad scales, which may obscure significant areas of impact in specific regions or sub-regions, and excessively fine scales, which could complicate the assessment process. This methodology was applied at the IMAP CIs 17					

Indicator Title	Common Indicator 17. Concentration of key harmful contaminants measured in the relevant matrix (EO9)
for monitoring data collected per each Spatial Assessment Unit (SAU) and per environmental matrix (sediments, biota) and per contaminant group (trace metals (TM), PAHs, PCBs) separately, considering the temporal coverage of monitoring data used again per each SAU and per environmental matrix (sediments, biota) and per contaminant group (trace metals (TM), PAHs, PCBs) separately. The 4-level and 3-level nesting approaches were implemented in the Adriatic Sea Sub-region and Western Mediterranean Sub-region, respectively. This resulted in the aggregation and integration of assessment results within the IMAP nested scheme at the following levels: 1. IMAP national Spatial Assessment Units (SAUs) and sub-SAUs (the finest level) 2. IMAP coastal and offshore assessment zones of sub-divisions 3. Sub-division and sub-regional levels (e.g., Adriatic Sea). For setting the IMAP assessment areas for CIs 13 and 14, the finest areas defined for CI 17 were adjusted to serve the purpose of eutrophication assessment. The scope of all SAUs and sub-SAUs was defined and introduced into the NEAT tool, along with their respective codes and surface areas (in km²). Within each SAU under ‘habitats’ the sediments and biota are introduced. Under ‘ecosystem component’ the 5 chemical compounds of CI 17 are assigned. For each SAU and ‘Ecological Component’ (EO9 contaminants in our case) and ‘Habitat’ (sediments, biota), average value and standard deviation per chemical compound is inserted. While arithmetic means and standard errors were used for CI 17, geometric means and standard errors were applied for CIs 13 and 14. Boundary limits and class threshold values per SAU, parameter, and matrix are applied according to the assessment scale presented in the section on targets. The aggregation of the 5 chemical compounds of CI17 was carried out to derive a single status value (NEAT value) for all levels of the nesting scheme. The aggregation of the assessment results for these compounds resulted in a NEAT value per specific SAU, which was then spatially integrated into the sub-divisions and regional levels. The assessment results were presented and visualized using a tabular format and graphical representations generated with a GIS tool. In the absence of sufficient <i>in situ</i> data reported for the Central Mediterranean, and Aegean and Levantine Seas Sub-regions, the CHASE+ (Chemical Status Assessment Tool) methodology was tested and then applied in these sub-regions. Its application was based on the experience of the European Environmental Agency (EEA) to assess environmental status categories for the European Seas (Andersen et al. 2016, EEA 2019)²⁵. The first step in this tool is to calculate the ratio $C_{\text{measured}}/C_{\text{threshold}}$ (C is the concentration) called the contamination ratio (CR) for each assessment element in a matrix. Then a contamination score (CS) is calculated as follows²⁶: $CS = \frac{1}{\sqrt{n}} \sum_{i=1}^n CR_i$ where n is the number of elements assessed for each matrix.	

²⁵ Andersen, J.H., Murray, C., Larsen, M.M., Green, N., Høgåsen, T., Dahlgren, E., Garnaga-Budrè, G., Gustavson, K., Haarich, M., Kallenbach, E.M.F., Mannio, J., Strand, J. and Korpinen, S. (2016) Development and testing of a prototype tool for integrated assessment of chemical status in marine environments. Environmental Monitoring and Assessment 188(2), 115.

EEA (2019) Contaminants in Europe's Seas. Moving towards a clean, non-toxic marine environment. EEA Report No 25/2018.

²⁶ The contamination sum minimizes the problem of ‘dilution’ of high values when several substances from an area are analyzed, and takes to some extent possible synergistic effects of contaminants into account by using square root of ‘n’ instead of ‘n’.

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Based on the contamination ratio (CR) or on contamination score (CS), the elements are assessed. In line with the results of assessments, the stations/areas are classified according to the assessment scale presented above in the section on targets. In order to avoid possible bias in the Mediterranean regional assessment that may occur as a result of the use of different assessment methodologies in different areas, comparisons and harmonization of the NEAT and the CHASE+ assessment methodologies were performed. It ensured reducing uncertainty and achieving harmonization across assessments conducted in different sub-regions and sub-divisions, despite variations in the number of sampling locations and measurements. Further details are provided in the thematic assessments of contaminants in sediments and biota and the 2023 MED QSR Pollution Assessment.	
Known gaps and uncertainties in the Mediterranean Important development areas in the Mediterranean Sea over the next a few biennia included harmonization of monitoring targets (determinants and matrices) within assessment at sub-regions scales, development of suites of assessment criteria, and review of the scope of the national monitoring programmes to ensure that those contaminants which are considered to be important within each assessment area are included. Through these and other actions, it was possible to develop targeted monitoring programmes tailored to meet the needs and conditions within each GES assessment sub-region. It was recognized that the open and deep sea is much less covered by monitoring efforts than coastal areas. Therefore, within monitoring programmes also areas beyond the coastal areas were included in a representative and efficient way (where risks warrant coverage). By building on the achievements up to 2023, during the preparation of the 2023 MED QSR, several knowledge gaps were identified in the monitoring and assessment of Common Indicator 17, which need to be addressed following the recommendations of the 2023 MED POL Focal Points Meeting. <i>Update of Environmental Assessment Criteria (EACs):</i> In order to update EACs, the methodology, as detailed in the European Commission Guidance Document (2018) and in Long et al. (1995), should be considered. This entails the creation of a database of scientific literature which elaborates where adverse biological effects, or no effect, are presented in conjunction with chemical data, in the environment and biota, at the same site and time. Briefly, those include but are not limited to sediment toxicity tests, aquatic toxicity tests in conjunction with equilibrium partitioning (EqP) and field, and mesocosm studies. The literature would then be analysed by experts and conclusions drawn. Laboratory results on biomarkers (CI18) are also important for the derivation of the EAC values. The emphasis should be given to the Mediterranean Sea biota species. These efforts are needed to ensure the revised Environmental Assessment Criteria supports integration of toxicity considerations into future GES/non-GES/ environmental assessments. In this regard, not only traditional contaminants should be considered, but also, optionally other contaminants found in the environment. <i>Undertake regular updates of Sub-regional and regional Background Concentrations (BCs) and Background Assessment Criteria (BACs):</i> As more data will be submitted to IMAP IS, the Sub-regional and regional BCs should be updated. It is proposed to undertake their regular updates at least 2 years prior to the QSRs preparation. This will allow for sufficient time to analyse the data, detect data gaps and ensure the submission of missing data, to perform a more robust update of the criteria for reliable assessments. The methodology for BACs calculation should be revised and updated. BACs are calculated from BCs by applying the multiplication factors. Due to the lack of Mediterranean data, UNEP/MAP	

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adopted the pragmatic methodology used by OSPAR. ²⁷ Therefore, the precision of monitoring per CP should be calculated and used to set the multiplication factors specific for the Mediterranean.		
Improve the GES assessment:		
Revision of IMAP needs to support the improvement of the good environmental status assessment and contribute to a more robust analysis, and facilitate integration and aggregation of CI 17 with other CIs and EOs, by undertaking the following priority actions:		
○ Update list of priority pollutants. Measurements of known contaminants of concern, such as As and Cu, and contaminants of emerging concern, such as pharmaceuticals and flame retardants should be considered for inclusion in the IMAP Pollution monitoring. This process should follow the initial steps undertaken in 2019.²⁸ The updated List of Priority Contaminants could provide the basis for a prioritization of substances to be further included in the IMAP Guidance Factsheets related to Ecological Objective 9, and complement presently agreed mandatory or recommended substances for CIs 17 and 20. The decision on which contaminant to add should be based on pilot studies checking the probability of their presence in the Mediterranean Sea sub-regions. ○ Extend the list of commonly agreed IMAP Pollution mandatory species. Species, other than species (<i>M. galloprovincialis</i> and <i>M. barbatus</i>) presently mandatory, should be added to the IMAP list. The species should be chosen based on their presence in the Sub-regions and their relevance as pollution indicators, which in turn will allow for an improved environmental assessment. Harmonization of the use of different species in different Sub-regions needs to be followed by setting the criteria (BCs and BACs) specific to each species. ○ Utilize tools to perform Environmental Risk Analysis, to integrate chemical and biological data, as elaborated here-below for CI 18. ○ Revise sediments` temporal monitoring requirements. For hot spot stations, the monitoring should remain every year or 2 years, while for other stations, the monitoring once or twice during the 6-year cycle should be considered. ○ Harmonize national efforts regarding contaminants monitoring. As a minimum, it is necessary to ensure that every CP reports all mandatory parameters in mandatory matrixes, including the wet weight for mussels, LOD or LOQ values, the grain size of samples for sediments, and spatial and temporal monitoring requirements. The significant differences among the countries in terms of LOD and LOQ values, as well as differences among the areas of monitoring in the same CP, need to be analyzed and drivers of the unsatisfactory analytical performance identified.		
Contacts and Version Date		
http://www.unepmap.org		
Version No	Date	Author
V.1	31.05.17	MEDPOL
V.2	11.09.17	MEDPOL
V.2	12.12.18	MEDPOL
V.4	31/05/2019	Approved by the Meeting of MED POL FPs

²⁷OSPAR calculated the ratio between BAC and BC (the multiplication factor) from known parameters. The pragmatic approach used in order to have 90% probability of concluding that concentration is below provided for BAC, $BAC = BC \exp(3.18 CV)$, where CV is the precision of the monitoring program (per determinant and matrix). In the case of OSPAR, temporal monitoring data from the UK National Marine Monitoring Programme was considered.

²⁸ UNEP/MED WG.463/Inf.4. The List of Priority Contaminants under MAP/Barcelona Convention within the MED POL Monitoring Programme and IMAP have been revised according to the latest lists of priority contaminants development in the EU region and internationally and shows no major changes compared to other RSCs.

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Final version	09/09/2019	Approved by the 7 th Meeting of EcAp Coordination Group
V4	28/05/2025	Joint CorMon Pollution and ML Meeting
V5		Approved by the Meeting of MED POL FPs
Final version		Approved by the 12 th Meeting of EcAp Coordination Group

9. The revision of IMAP **Common Indicator 18 (EO9)**: “Level of pollution effects of key contaminants where a cause and effect relationship has been established” is presented in the table below.

Indicator Title	Common Indicator 18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)	
Relevant GES definition	Related Operational Objective	Proposed Target(s) ²⁹
Concentrations of contaminants are not giving rise to negative effects on health status of marine biota	Effects of released contaminants are minimized	State: - Contaminants effects below thresholds. Pressure: - Decreasing trend in the operational releases of oil and other contaminants from coastal, maritime and offshore activities.
Rational		
Justification for indicator selection Biomarkers are used to infer on a cause-effect relationship between a stressor and a biotic effect. The biotic effects can be biochemical, physiological, toxicological and/or be detected at the ecological/community level. The World Health Organization (WHO, 1993) further defined biomarkers as: (1) a biomarker of exposure and (2) a biomarker of effect (Lomartire et al. 2021). Biological effects monitoring has been progressively integrated into IMAP-based national monitoring programmes. It is essential to further expand and enhance the application of biological effects methods, including the integration of chemical and biological effects monitoring and assessment, in order to adequately address Ecological Objective 9 (EO9). Upon exposure to certain dose of harmful contaminants, marine organisms start manifesting a number of symptoms that are indicative of biological damage, the first ones appearing after a short while at the sub-cellular level. These 'sub lethal' effects, when integrated, often converge to visible harm for the organisms and possibly to the whole population at a later stage, when it will be too late to limit the extent of biological damage resulting from environmental chemical exposure and ecosystems deterioration. Most of these symptoms have been reproducibly obtained in the laboratory (at high dose) and the various biological mechanisms of response to major xenobiotics are now sufficiently well documented. In the latest decades, scientific research has been intensified		

²⁹ Following the decisions to be made at the present meeting regarding minor adjustments to the Targets, as outlined in working document UNEP/MED WG.626/3/Rev.1, the revised Targets will be incorporated into the revised IMAP Pollution Indicators Factsheets.

Indicator Title	Common Indicator 18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)
towards these alternative cellular and sub-cellular methods for integrated pollution monitoring, despite it revealed a more complex panorama with samples exposed to environmental concentrations, which includes a number of confounding factors hindering the cost-effective and reliable determination of biological effects at cellular and sub-cellular levels. As a consequence, most of these methods (biomarkers), based on the chemical exposure to biological effects cause relationships, are envisaged to monitor hotspots stations, dredging materials assessments, local damage evaluations and other sites of particular concern. Ongoing research (biomarkers, bioassays) and future research trends, such as 'omics' developments, will further define the indicators and the methodologies for these common indicators for toxicological effects. Biomarkers are classified as per the expected protection/defense response, including the most used as collected from the recent literature for the Mediterranean Sea, as presented below in the Section on Indicator Definition.	
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Viarengo, A., Lowe, D., Bolognesi, C., Fabbri, E., Koehler, A., 2007. The use of biomarkers in biomonitoring: a 2-tier approach assessing the level of pollutant-induced stress syndrome in sentinel organisms. <i>Comp. Biochem. Physiol. C</i> 146, 281-300. WHO (1993). World Health Organization & International Programme on Chemical Safety. Biomarkers and risk assessment : concepts and principles / published under the joint sponsorship of the United Nations environment Programme, the International Labour Organisation, and the World Health Organization. World Health Organization. Zaidi, M., Athmouni, K., Metais, I., Ayadi, H. and Leignel, V. (2022) The Mediterranean limpet <i>Patella caerulea</i> (Gastropoda, Mollusca) to assess marine ecotoxicological risk: a case study of Tunisian coasts contaminated by metals. <i>Environmental Science and Pollution Research</i> 29(19), 28339-28358. Zitouni, N., Bousserhine, N., Belbekhouche, S., Missawi, O., Alphonse, V., Boughatass, I. and Banni, M. (2020) First report on the presence of small microplastics ($\leq 3 \mu\text{m}$) in tissue of the commercial fish <i>Serranus scriba</i> (Linnaeus, 1758) from Tunisian coasts and associated cellular alterations. <i>Environmental Pollution</i> 263, 114576.	
Policy Context and Targets	
Policy context description In most Mediterranean countries, the monitoring of a range of hazardous chemical substances in different marine compartments are undertaken in response to the UNEP/MAP Barcelona Convention (1976) and its Land-Based Protocol, through the coordination of the UNEP/MAP MED POL Monitoring Program. For Mediterranean EU countries, the European legislation on the Marine Environment also applies (e.g. EU WFD and EU MSFD), as well as other international and national policy drivers. A considerable amount of founding knowledge and actions are available through the pollution monitoring and assessment component of the UNEP/MAP MED POL Programme during the past decades until today, including monitoring pilot programmes (Eco-toxicological effects of contaminants). The environmental assessments have been used for the identification and confirmation of significant marine contaminants effects on biota and therefore, impacts on biodiversity; as well as, for the continuous development of monitoring strategies and guidance. With respect to the Ecosystem Approach and IMAP, their implementation will continue under the benefits gained from this past knowledge and the policy and practical framework built in the Mediterranean Sea. The 2017 MED QSR assessment identified significant knowledge gaps, emphasizing the need for future development efforts in the Mediterranean Sea to focus on several key areas. These include validating the added value of biomarkers as 'early warning' indicators in long-term marine monitoring, testing innovative research-based tools such as 'omics' technologies, harmonizing analytical quality standards, and developing comprehensive assessment criteria that integrate chemical and biological methods. Additionally, a review of the scope and effectiveness of current biological effects monitoring programmes is recommended. Together, these actions will support the design of targeted and effective monitoring strategies aligned with CI18 requirements under the IMAP framework and GES assessments. In light of the above, progress was made in 2021 with the proposal agreed by the Ecosystem Approach Correspondence Group on Pollution Monitoring to integrate data from CI-18 (Biomarkers) and CI-17 (Chemical Monitoring) into the assessment process. The proposed methodology combines the effects of single chemical pollutants, to take into consideration possible additive or synergistic environmental effects among them and then evaluate the risk to marine organisms exposed to the pollutants in water and sediments. The integration procedure consists of three modules: (i) a chemical module for integration of the data concerning the concentration of the pollutants; (ii) an ecotoxicological module that integrates data of the biological effects in marine organisms; and (iii) an integration module that combines the two lines of evidence in an Environmental Risk Index.	

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Evaluation of the environmental risk is usually obtained by an “expert judgement of a panel of qualified environmental scientists. Applying the Environmental Risk Index will result in objective risk values which allow national and regional policy makers and environmental managers to decide on required actions to decrease marine contamination, or to remediate a polluted area. The effectiveness of these actions can subsequently be monitored and quantified until an acceptable Environmental Risk Index is achieved. However, this approach still cannot be applied given lack of data reporting and capacities at the national level.	
Targets The GES targets under Common Indicator 18 need to maintain the contaminants effects below threshold further to decreasing trend in the operational releases of oil and other contaminants from coastal, maritime and off-shore activities. The present lack of data availability in the IMAP Integrated Monitoring and Assessment Programme (IMAP IS) and relevant scientific studies does not allow for the proposal of a boundary limit between Good Environmental Status (GES) and non-GES status of CI 18. This boundary limit should primarily follow on progress in determining or updating the Background Assessment Concentrations (BAC) and Environmental Assessment Criteria (EAC) for biomarkers in the selected pilot sub-region(s)/sub-division(s) based on studies and <i>in situ</i> biomarker data. All relevant national and international practices and sources need to be considered, along with gathering information on biomarkers including relevant information, such as citation, type of test, biological effect measured, analytical approach used, study area, test duration, species/tissues tested, chemical concentrations, and other pertinent details.	
Policy documents General Policy documents Decision IG.21/3 (COP18,2013) on Ecosystems Approach including adopting definitions of Good Environmental Status (GES) and Targets (UNEP(DEPI)/MED IG.21/9). Decision IG.22/7 (COP19, 2016) on Integrated Monitoring and Assessment Programme (IMAP) of the Mediterranean Sea and Coast and Related Assessment Criteria (UNEP(DEPI)/MED IG.22/28). Decision IG.25/1 (COP22, 2021) on UNEP/MAP Medium-Term Strategy 2022-2027. Decision IG.22/7 (COP19, 2016) on the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria. Decision IG.23/6 (COP20, 2017) on 2017 Mediterranean Quality Status Report. Decision IG.24/4 (COP21, 2019) on Assessment Studies. Decision 26/3 (COP23, 2023) on the 2023 Mediterranean Quality Status Report and a Renewed Ecosystem Approach Policy in the Mediterranean. Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (EU Marine Strategy Framework Directive and updates in 2010). Commission Directive (EU) 2017/845 amending Directive 2008/56/EC of the European Parliament and of the Council as regards the indicative lists of elements to be taken into account for the preparation of marine strategies	

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Commission Decision (EU) 2017/848 laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardised methods for monitoring and assessment, and repealing Decision 2010/477/EU. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (and updated revisions). Commission Decision (EC) No 2013/480/EU establishing, pursuant to Directive 2000/60/EC of the European Parliament and of the Council, the values of the Member State monitoring system classifications as a result of the intercalibration exercise and repealing Decision 2008/915/EC. 2017 Mediterranean Quality Status Report, https://www.medqsr.org/node/10/ 2023 Mediterranean Quality Status Report, medqsr2023.info-rac.org UNEP(DEPI)/MED IG.22/Inf.7. (2016) Integrated Monitoring and Assessment Guidance	
Biological Effects related Policy documents	
OSPAR Commission, 2013. Levels and trends in marine contaminants and their biological effects - CEMP Assessment Report 2012. Monitoring and Assessment Series, 2013	
OSPAR Commission, 2013. Levels and trends in marine contaminants and their biological effects - CEMP Assessment Report 2012. Monitoring and Assessment Series, 2013	
OSPAR 2017. https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/pressures-human-activities/contaminants/	
OSPAR (2008) Co-ordinated Environmental Monitoring Programme (CEMP) Assessment Manual for contaminants in sediments and biota. OSPAR Commission No. 379/2008	
UNEP(DEC)/MED WG.372/3. (2012) Approaches for definition of GES and setting targets for the pollution related ecological objectives in the framework of the ecosystem approach. (EO5: eutrophication, EP9: contaminants, EP10: marine litter, EO11: noise).	
UNEP/RAMOG: Manual on the Biomarkers Recommended for the UNEP/MAP MED POL Biomonitoring Programme. UNEP, Athens, 1999.	
UNEP (1997), The MED POL Biomonitoring Programme Concerning the Effects of Pollutants on Marine Organisms Along the Mediterranean Coasts. UNEP(OCA)/MED WG.132/3, Athens, 15 p.	
UNEP (1997), Report of the Meeting of Experts to Review the MED POL Biomonitoring Programme. UNEP(OCA)/MED WG.132/7, Athens, 19 p.	
UNEP(DEPI)/MED WG. 365/Inf.8. Development of assessment criteria for hazardous substances in the Mediterranean. Consultation Meeting to Review MED POL Monitoring Activities. Athens, 22-23 November 2011.	
UNEP/MAP WG.492/6 (2021). The Proposal for Strengthening Implementation of Biomonitoring related to IMAP Common Indicator 18. Meeting of the Ecosystem Approach Correspondence Group on Pollution Monitoring, Videoconference, 19-21 April 2021	
UNEP/MAP WG.509/43 (2021) – Report of the Meeting of the MED POL Focal Points, 27–28 May and 6–7 October 2021, Annex III, Appendices 22–24, p. 2514.	
UNEP/MAP WG. 533/Inf.3 (2022). Adjusted Background (Assessment) Concentrations (BC/BAC) for Common Indicator 17 and Upgraded Approach for Environmental Assessment Criteria (EAC) for IMAP Common Indicators 17, 18 and 20. Meeting of the Ecosystem Approach Correspondence Group on Pollution Monitoring, Videoconference, 27 and 30 May 2022.	

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UNEP/MAP – MED POL (2022). UNEP/MED WG 533/10, Appendix V. Data Standards and Data Dictionaries for IMAP Common Indicator 18. Meeting of the Ecosystem Approach Correspondence Group on Pollution Monitoring, Videoconference, 27 and 30 May 2022.	
Indicator analysis methods	
Indicator Definition	
In marine bivalves (such as <i>Mytilus galloprovincialis</i>) and/or fish (such as <i>Mullus barbatus</i>)	
Lysosomal Membrane Stability (LMS) - biomarker of membrane integrity used as general screening of contaminant exposure stress.	
Acetylcholinesterase (AChE) - enzyme involved in impulse transmission, providing assay as a method for assessing neurotoxic effects, metabolism impairment and immune disturbance in marine animals.	
Micronucleus assay test (MN frequency) - a tool for assessing cytogenetic/DNA damage in marine organisms.	
Sub-indicators:	
In addition to the biomarkers listed above for monitoring IMAP Common Indicator 18, the sub-indicators also include the following biomarkers, classified according to the expected protection/defence responses. Biomarkers highlighted in bold are included in the IMAP Common Indicator 18 Data Standards (DSs). Their classification (mandatory or additional/non-mandatory), along with the relevant organism and tissue for testing, is provided in the table below. All other parameters required for reporting data under IMAP Common Indicator 18 are outlined in the Common Indicator 18 Data Standards (DSs)..	
• Metallothionein (MTs). An increase of the cellular MT-protein level is considered as a protective effect against an excess of harmful metals. • Stress on Stress (SoS), the survival on air is a general method to determine the physiological condition in bivalves. • Antioxidant defense enzymes: Superoxide dismutase (SOD) that eliminates superoxide anion, catalase (CAT) and glutathione peroxidase (GPx) which remove hydrogen peroxide and glutathione reductase (GRd) which regenerates glutathione (GSH), an important non-enzymatic antioxidant against ROS (reactive oxygen species). • Detoxification enzymes: CYP1A1 (frequently measured as ethoxyresorufin-O21 deethylase (EROD) activity and glutathione-S-transferase (GST), • Butyrylcholinesterase enzymatic activity (BChE), • Detoxifying enzyme Carboxylesterase (CE) activity - potential biomarkers of chemical exposure, as they are an important family of enzymes involved in the metabolism of xenobiotic and endogenous compounds. • Expression of vitellogenin (VTG), a lipoprotein produced in female fish and used as a biomarker for endocrine disruption. • Metabolic biomarkers: Electron Transport System activity (ETS) and glycogen reserves (GLY). • Lactate dehydrogenase (LDH), and citrate synthase (CS): biomarkers for anaerobic and aerobic metabolism. • OMICS, in particular Transcriptomics, a key branch of OMICS. • Oxidative damage markers: lipid peroxidation (LPO) and protein carbonyl derived levels (CARB).	

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- Phase I detoxifying enzyme - 7-benzyloxy-4-[trifluoromethyl]-coumarin-O-debenzyloxylase (BFCOD). - Histopathological alteration - DNA damage – single-cell gel electrophoresis (SCGE) or Comet Assay, DNA adducts et other.					
Biomarker	Description (EN)	Organism	Tissue	Mandatory	Additional (Not-mandatory)
LMS-HEXO	Lysosomal membrane stability on cryostat sections - enzymatic determination	Fish/Mussel	Liver/Digestive gland	Y	
LMS-NRRT	Lysosomal membrane stability in mussel haemocytes - in vivo determination (neutral red retention time (NRRT) assay)	Mussel	Haemocytes (in vivo)	Y	
MN_F	Micronuclei frequency in fish blood cells	Fish	Erythrocytes	Y	
MN_MH	Micronuclei (MNi) frequency in mussel gill cells and haemocytes	Mussel	Gill cells, Haemocytes	Y	
AChE	Acetylcholinesterase activity - enzymatic determination	Mussel / Fish	Gills / Muscle	Y	
% LMS	% LMS Mean percentage of Lysosomal membrane stability in mussel	Mussel	Haemocytes		Y
MT	Metallothioneins	Mussel	Digestive gland		Y
SoS	Stress on stress	Mussel	Whole organism		Y
EROD	Ethoxyresorufin-o-deethylase activity	Fish	Liver		Y
NM	Other: not mandatory biomarker	Specify	Specify		Y

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Methodology for indicator calculation Lysosomal Membrane Stability (LMS): Biological techniques (neutral red retention), including microscopy Acetylcholinesterase (AChE) assay: Biochemical techniques, including spectrophotometry Micronucleus assay: Biochemical techniques, including microscopy Additional parameters to be recorded: biometrics (size/length, age), biological parameters such as condition index (mussels), condition factor, gonadosomatic index, hepatosomatic index (fish) and data on temperature, salinity and oxygen dissolved. The detailed analytical procedure for the biomarkers regulated under CI 18 and other related mandatory parameters, including sampling and sample transportation, analytical determination of indicators and sub-indicators, and data quality control are outlined in C-1. Monitoring Guidelines/Protocols for sampling and analysis of biomarkers in marine molluscs (such as <i>Mytilus</i> sp.) and fish (such as <i>Mullus barbatus</i>).	
Indicator units (retention) (labilization period) minutes - Lysosomal Membrane Stability (LMS) nmol/min mg protein in gills (bivalves) or muscle (fish) - Acetylcholinesterase (AChE) assay number of cases, ‰ in haemocytes“ (bivalves) or erythrocytes (fish) - Micronucleus assay Data Standards for IMAP CI 218 elaborates units for all mandatory and other chemicals and parameters	
List of Guidance documents and protocols available IMAP Monitoring Guidelines/Protocols (https://www.iaea.org/about/organizational-structure/department-of-nuclear-sciences-and-applications/division-of-iaea-environment-laboratories/marine-environmental-studies-laboratory/unep-map-med-pol-integrated-monitoring-and-assessment-programme-imap-monitoring-guidelines) ○ C-1. Monitoring Guidelines/Protocols for sampling and analysis of biomarkers in marine molluscs (such as <i>Mytilus</i> sp.) and fish (such as <i>Mullus barbatus</i>); ○ E-1. Monitoring Guidelines/Protocols for Analytical Quality Assurance for IMAP Common Indicators 13, 14, 17, 18 and 20; ○ F-1. Monitoring Guidelines/Protocols for Reporting Monitoring Data for IMAP Common Indicators 13, 14, 17, 18 and 20; ○ E-1. Monitoring Guidelines/Protocols for Analytical Quality Assurance for IMAP Common Indicators 13, 14, 17, 18 and 20; ○ F-1. Monitoring Guidelines/Protocols for Reporting Monitoring Data for IMAP Common Indicators 13, 14, 17, 18 and 20. European Commission, 2014. Technical report on effect-based monitoring tools. Technical Report 2014 – 077. European Commission, 2014.	

Indicator Title	Common Indicator 18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)
UNEP/RAMOGGE: Manual on the Biomarkers Recommended for the UNEP/MAP MED POL Biomonitoring Programme. UNEP, Athens, 1999. UNEP/MAP, 2005. Fact sheets on Marine Pollution Indicators. Meeting of the UNEP/MAP MED POL National Coordinators. Barcelona, Spain, 24-27 May 2005. UNEP(DEC)/MED/ WG.264/ Inf.14. UNEP, Athens. ICES Cooperative Research Report. No.315. Integrated marine environmental monitoring of chemicals and their effects. I.M. Davies and D. Vethaak Eds., November 2012.	
Data Confidence and uncertainties Selected analytical validated methods should be subject to Quality Assurance Protocols and interlaboratory exercises: QA/QC. Up to 2023, the IAEA/MESL, in collaboration with the UNEP/MAP - MED POL, implemented 56 interlaboratory comparisons/proficiency tests for the analysis of trace elements and organic contaminants, as well as 64 training courses on the analysis of trace elements and organic contaminants in marine samples. At its 2021 meeting, the Ecosystem Approach Correspondence Group on Pollution Monitoring agreed on the scope of an intercalibration exercise to support quality assurance related to IMAP Common Indicator 18. This included the intercalibration of Lysosomal Membrane Stability (LMS), Micronuclei frequency (MNI), Acetylcholinesterase activity (AChE), and Stress on Stress (SoS), as well as the organization of a training course aimed at strengthening the implementation of IMAP Common Indicator 18. However, the implementation of this intercalibration component for CI 18 could not be carried out in collaboration with IAEA/MESL, due to the absence of the specific technical and scientific expertise required. . Further efforts are required to establish an intercalibration exercise for IMAP Common Indicator 18. This may involve exploring alternative models for organizing intercalibration tests with partners other than IAEA/MESL, as well as considering different modalities such as ring tests.	
Methodology for monitoring, temporal and spatial scope Available Methodologies for Monitoring and Monitoring Protocols With regard the Ecosystem Approach and IMAP implementation, there are considerable benefits to be gained from taking advantage of previous knowledge and information developed through the UNEP/MAP MED POL. These actions include (1) the use of existing experience in the design of monitoring programmes, (2) the use of existing guidance on sampling and analytical methods to inform technical aspects of ecosystem approach monitoring, (3) the use of existing sampling station networks as a framework for the ecosystem approach monitoring networks, (4) the use of existing statistical assessment tools and work on assessment criteria as the basis for the assessments of ecosystem approach data, (5) the use of existing data to describe the distributions and levels of contaminants and effects against EACs and reference concentrations , and (6) the use of existing time series as the basis of monitoring against a “no deterioration” target. The availability of quality assured data is essential for the assessment of levels and trends, and thus, their comparability overtime and across spatial scales. Building on elements elaborated in the Integrated Monitoring and Assessment Programme (2016 IMAP), including the above-mentioned components, the Monitoring Guidelines—structured around the specific technical protocols related to IMAP Common Indicator 18 —were comprehensively developed by the MED POL Programme in cooperation with IAEA/MESL. These guidelines were approved by the MED POL Focal Points Meeting (2021). They build upon the knowledge and practices obtained over 40 years of MED POL monitoring implementation and recent publications, highlighting the current practices of the Contracting Parties’ marine laboratories, as well as other	

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Regional Seas Conventions and the EU. A thorough analysis of presently available practices of UNEP/MAP, UNEP and IAEA, as well the HELCOM, OSPAR and European Commission Joint Research Centre was undertaken to assist an innovative approach for preparation of the IMAP Monitoring Guidelines/Protocols. The monitoring methodologies and practices are elaborated for sampling, sample preservation and transportation, sample preparation and analysis, along with quality assurance and reporting of monitoring data, for their use by the IMAP competent laboratories in order to ensure the representativeness and accuracy of the analytical results. These guidelines present a summary of the best available known practices employed in marine monitoring by bringing integrated comprehensive analytical practices that can be applied in order to ensure the representativeness and accuracy of the analytical results needed for generation of quality assured monitoring data. The Monitoring Guidelines for IMAP Common Indicator 18 outline the following monitoring and reporting practices: ○ C-1. Monitoring Guidelines/Protocols for sampling and analysis of biomarkers in marine molluscs (such as <i>Mytilus</i> sp.) and fish (such as <i>Mullus barbatus</i>). ○ E-1. Monitoring Guidelines/Protocols for Analytical Quality Assurance for IMAP Common Indicators 13, 14, 17, 18 and 20; ○ F-1. Monitoring Guidelines/Protocols for Reporting Monitoring Data for IMAP Common Indicators 13, 14, 17, 18 and 20.	
Available data sources i. IMAP Info System (http://imapinfosystem.info-rac.org/app/#/) – once datasets will be reported for CI 18 (the MEDPOL Pilot Biomonitoring Program (presently with only a few countries reporting data by 2005) and one dataset reported by a Contracting Party in 2023). ii. Recently reviewed literature, due to the absence of in situ data reported for CI 18, as elaborated in the CI 18 thematic assessment and the 2023 MED QSR Pollution Assessment iii. Additional potential data sources: The new scientific literature sources providing data on the no effect or adverse biological effects, in conjunction with chemical data from the environment and biota at the same site and time (to be made available during the revision of the EAC for IMAP Common Indicator 17). iv. The data and information derived from the execution of EU-funded research programmes related to the biological effects of environmental pollution in marine and coastal ecosystems. v. Studies and results from biological effects monitoring, as available from the International Council for the Exploration of the Sea (ICES), the OSPAR Commission, and the Baltic Marine Environment Protection Commission (HELCOM).	
Spatial scope guidance and selection of monitoring stations The spatial scope for monitoring should include reference and coastal long-term master stations, including offshore, as applicable, distributed spatially as relevant and include local spatial refinements, such as transect sampling, and therefore, is a direct function of the risk-based assessments and the long-term monitoring purpose. The selection of the sampling sites for the monitoring of biological effects in the marine environment should consider: • Risk areas of concern identified on the basis of the review of the existing information. • Vulnerable areas of known past and/or present release of chemical contaminants. • Offshore areas where risk warrants coverage (aquaculture, offshore oil and gas activity, dredging, mining, dumping at sea and others). • Monitoring sites representative of other sources, such as shipping and atmospheric inputs.	

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• Reference monitoring sites: to establish scale-based reference values and background concentrations. • Monitoring sites representing sensitive pollution sites/areas at national and sub regional scale. • Monitoring sites in deep-sea sites, offshore stations (sediments) and areas of potential particular concern. The selected sites should allow the collection of a realistic number of samples over the years (e.g. allow to sample sufficient number of biota for the selected species during the duration of the programme). It is essential that the monitoring strategies are being coordinated at regional and/or sub regional level, in particular with chemical monitoring. The coordination with monitoring for other Ecological Objectives is crucial for cost-effective and future integrated assessment.	
Temporal Scope guidance Sampling frequencies is determined according the current status of the pilots and national marine monitoring programmes: INITIAL PHASE of IMAP MONITORING (PILOT): to identify monitoring stations to collect BIOTA (bivalves, such as <i>Mytilus galloprovincialis</i>) on a yearly basis (or higher frequencies if the environmental variability study needs to be carried out), and in the same manner as for chemical monitoring, focusing on few locations such as hotspots and reference stations. ADVANCED PHASE of IMAP MONITORING: when fully completed IMAP Initial Phase implementation with the ongoing data reporting on biological effects, the objective should be the integration of the chemical and biological monitoring on a efficient manner in line with the integration of data from CI-18 (Biomarkers) and CI-17 (Chemical Monitoring) into the assessment process as agreed by the Ecosystem Approach Correspondence Group on Pollution Monitoring. Therefore, a refinement of the successful strategies for biological effects long-term monitoring should be implemented and maintained based on the experiences from developing pilot monitoring activities (Initial Phase). Sampling should include the yearly collection of both bivalves, such as <i>Mytilus galloprovincialis</i>, and fish, such as <i>Mullus barbatus</i>. For trend determinations the sampling frequencies will depend on the ability to detect trends considering the environmental and the analytical variability (ca. total uncertainty). It can be possible to decrease the sampling frequencies in cases where established time trends and levels show concentrations well below levels of concern, and without any upward trend over a number of years.	
Data analysis and assessment outputs	
Statistical analysis and basis for aggregation – Assessment Criteria Monitoring should allow the necessary statistical data treatments and long-term time-trend analysis. 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. The BAC and EAC values for IMAP Common Indicator 18 were not updated by Decision 26/3 (COP23, 2023) on the 2023 Mediterranean Quality Status Report and a Renewed Ecosystem Approach Policy in the Mediterranean 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 table here-below. The Mediterranean EACs for Biomarkers remains based on OSPAR values. 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.	

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Laboratory results on biomarkers (CI18) are also important for the derivation of the EAC values for CI 17.				
Mediterranean BACs and EACs for biomarkers in mussel (<i>M. galloprovincialis</i>) as endorsed by Decisions IG.22/7 and IG.23/6.				
Biomarkers/Bioassays and units	BACs IG.23/6 in Mussels (<i>Mytilus galloprovincialis</i>)	EACs IG.23/6 in Mussels (<i>Mytilus galloprovincialis</i>)	BACs IG.22/7 in Mussels (<i>Mytilus galloprovincialis</i>)	EACs IG.22/7 in Mussels (<i>Mytilus galloprovincialis</i>)
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			
<i>^aTechnical 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.</i>				
<i>*Moore et al., 2006 (Standard values adopted by ICES)</i>				
Ongoing efforts focus on establishing an improved methodology for determining Background Assessment Concentrations (BAC) and Environmental Assessment Criteria (EAC) for biomarkers at regional and sub-regional levels, depending on data availability. These efforts also include proposing new biomarkers to enhance the monitoring and assessment of CI 18.				
Alongside the application of environmental status for CI 18 using BAC and EAC values, the assessment of effects through comparison of biomarker values at monitoring stations with those measured at control sites (monitored concurrently with the selected sampling stations) should be considered a valid alternative. This approach is particularly relevant in cases where the application of BAC and EAC values is not feasible, such as for antioxidant biomarkers.				
Expected assessments outputs				
For biological effects, trends analysis and distribution levels could be carried out on sub-regional level, provided appropriate quality assured datasets are available. For the integrated assessment of				

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GES, it would be carried out using Mediterranean data from IMAP Info System and relevant scientific literature sources and applying IMAP CI 18 assessment criteria Due to the complete lack of data reporting into the IMAP Information System (IMAP IS) by the Contracting Parties (CPs), the assessment input for the 2023 MED QSR related to the status assessment of IMAP CI-18 was based on bibliographic studies. This approach mirrors the methodology used in the preparation of the 2017 MED QSR, updated with more recent scientific literature. The studies included in the review were selected according to the following criteria: • Data derived exclusively from the Mediterranean Sea; • Studies conducted since 2016 and published from 2018 onwards. A total of 24 studies were retrieved from the scientific literature. In the Central and Western Mediterranean Sea (CEN and WMS), the biomarkers examined were either not listed under IMAP or, if listed, were not analyzed in the required organ or tissue as specified by IMAP guidelines. Most studies assessed multiple biomarkers at the same sampling stations, with inconsistent results—some showing effects and others not. The mandatory monitoring species, <i>Mytilus galloprovincialis</i> and <i>Mullus barbatus</i>, were included in five and four studies, respectively. Additionally, ten fish species, six mollusc species, and two polychaete species were examined across the reviewed literature. Among the biomarkers for IMAP CI-18: • Acetylcholinesterase (AChE) was reported in 13 studies, • Metallothionein (MT) in 5 studies (2 on molluscs, 2 on fish, and 1 on a polychaete species), • Micronuclei (MN) in 2 studies, • Lysosomal membrane stability via Neutral Red Retention Time (LMS-NRRT) in 1 study. The most frequently reported additional biomarkers were: • Catalase (CAT) in 15 studies, • Malondialdehyde (MDA) in 12 studies, • Glutathione S-transferase (GST) in 11 studies, • Superoxide dismutase (SOD) in 9 studies, • Glutathione peroxidase (GPx) in 8 studies. Further details are provided in the thematic eutrophication assessments and the 2023 MED QSR Pollution Assessment.	
Known gaps and uncertainties in the Mediterranean Further to the significant progress achieved over the last few biennia regarding the standardizing monitoring practices and progressing towards the environmental assessment tools, it is essential to ensure GES assessment for CI 18. Revision of IMAP needs to support the good environmental status assessment for CI 18 and facilitate its integration and aggregation with other CIs and EOs, by undertaking the priority actions to address key gaps: ○ Review and update the list of CI 18 biomarkers, along with the monitoring species; ○ Review and update, as appropriate, the assessment criteria as adopted by Decisions IG.22/7 (COP 19) and IG.23/6 (COP 20), as well as the assessment methodologies; ○ Further to the initial work undertaken in 2021 towards the development of the Biomonitoring related to IMAP CI 18, the following further actions should be tested: i) An application of new biomarkers should be explored to support the strengthening of CI 18 monitoring and assessment. ii) Use of the Environmental Risk Analysis should be provided by combining the chemical and ecotoxicological data, to support the evaluation of the risk related to marine	

Indicator Title		Common Indicator 18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)
		organisms exposed to contaminated waters and sediments. It should result in objective risk values which allow national and regional policymakers and environmental managers to decide on the actions to decrease marine contamination, or to remediate a polluted area. Through these and other actions, it will be possible to develop targeted and effective monitoring programmes tailored to meet the needs and conditions within each GES assessment sub-region. It has been recognized that the open and deep sea is much less covered by monitoring efforts than coastal areas. There is a need to include within monitoring programmes also areas beyond the coastal areas in a representative and efficient way, where risks warrant coverage.
Contacts and version Date		http://www.unepmap.org
Version No	Date	Author
V.1	31.05.17	MEDPOL
V.2	12.12.18	MEDPOL
V.3	31/05/2019	Approved by the Meeting of MED POL FPs
Final version	09/09/2019	Approved by the 7 th Meeting of EcAp Coordination Group
V4	28/05/2025	Joint CorMon Pollution and ML Meeting
V5		Approved by the Meeting of MED POL FPs
Final version		Approved by the 12 th Meeting of EcAp Coordination Group

10. The revision of IMAP **Common Indicator 20 (EO9)**: “Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood” is presented in the table below.

Indicator Title		Common Indicator 20. Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood (EO9)
Relevant GES definition	Related Operational Objective	Proposed Target(s)³⁰
Concentrations of contaminants are within the regulatory limits for consumption by humans.	Levels of known harmful contaminants in major types of seafood do not exceed established standards	State: Concentrations of contaminants in foodstuffs are below the UNEP/MAP Environmental Assessment Criteria approved for the protection of human

³⁰ Following the decisions to be made at the present meeting regarding minor adjustments to the Targets, as outlined in working document UNEP/MED WG.626/3/Rev.1, the revised Targets will be incorporated into the revised IMAP Pollution Indicators Factsheets.

Indicator Title	Common Indicator 20. Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood (EO9)	
		health. Decreasing trend in the frequency of cases of seafood samples above the approved UNEP/MAP Environmental Assessment Criteria
Rational		
Justification for indicator selection One of the potential risks associated with the occurrence of harmful substances (chemicals, nanoparticles, microplastics, toxins) in the marine environment is the human exposure through commercial fish and shellfish species (primarily, from wild fisheries and aquaculture). These organisms are exposed to environmental contaminants which enter their organism through different mechanisms and pathways according their trophic level, which include from filter feeding to predatory strategies (crustaceans, bivalves, fish). Consequently, there exist both bioaccumulation and biomagnification processes of these chemicals released in the marine environment. Common examples are the well-known bioaccumulation of metals and organic compounds in commercial bivalve species (such as the <i>Mytilus galloprovincialis</i> in the Mediterranean Sea) or alkyl mercury compounds (methylmercury) in tuna fish, which should be increased by new and contaminants of emerging concern in the near future. The studies considered for the assessment of contaminants in seafood within the 2023 MED QSR reported concentrations of contaminants and compared them to EU regulations, while some also addressed national regulations as well as international regulations or advisories (De Witte et al. 2022). Most of the studies also provided risk assessments to human health from the consumption of seafood by calculating the estimated daily intake (EDI), target hazard quotient (THQ), total risk (HI), cancer risk, among others. This emphasizes that the risk to human health (and hence GES-non GES status) should not be evaluated based on the concentration of a single contaminant but should be evaluated together with other factors such as synergy with other contaminants, temporal and spatial scales.		
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Indicator Title	Common Indicator 20. Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood (EO9)
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lagoon: Preliminary results on seawater-mussel transfer and implications for environmental protection and seafood safety. Marine Pollution Bulletin 158, 111355. Zaza, S. <i>et al.</i> 2015. Human exposure in Italy to lead, cadmium and mercury through fish and seafood product consumption from Eastern Central Atlantic Fishing Area. Journal of Food Composition and Analysis, 40, 148-153.	
Policy Context and Targets	
Policy context description The understanding of the health risks to humans (maximum levels, intake, toxic equivalent factors, etc.) and the food safety prevention, including contaminants of emerging concern, through the consumption of potentially poisoned seafood is a challenge and a priority policy issue for governments, as well as a major societal concern. There are different initiatives and regulations at national and international levels mainly for the fishery economic sector, which have established public health recommendations and maximum regulatory levels for different contaminants in numerous marine commercial target species. Methylmercury poisoning continues as a global priority policy issue and in 2013 the Global Legally Binding Treaty (Minamata Convention on Mercury) was launched by UNEP. Further, the US Food and Drugs Administration, the European Food Safety Authority, as well as Food and Agriculture Organization (FAO), are also national and international authorities with regard seafood safety, respectively. Within the current efforts to establish a baseline for measuring trends in contaminant concentrations in seafood, the JRC (2010) is considered, which suggests taking into account 'the frequency with which levels exceed regulatory levels, the actual levels that have been detected, the number of contaminants for which exceeding levels have been detected, and in parallel the origin of the contamination (geological versus anthropogenic, local versus long distance).' It also stipulates that 'Further, an intake assessment considering the importance of the species showing exceeding levels in the human diet could be taken into account. If regulatory levels are exceeded in one species, it does not mean that all seafood consumption from this sub-region is dangerous.' The literature search on seafood quality in the Mediterranean Sea in preparation for the 2023 MED QSR focused on studies reporting data from 2016/2017 onward, emphasizing contaminants regulated in the EU. Another point to note is that recent literature emphasizes the connection between seafood safety and quality and the presence of microplastics in the marine environment (i.e., Wakkaf et al. 2020, among many others). The human health may be impacted either by consuming seafood with microplastic content, or seafood with contaminants that were leached from the microplastic to the organism.	
Targets The GES targets under Common Indicator 20 need to maintain the chemical contaminants of human health concern under regulatory levels in seafood as agreed by national and international authorities and their trends with regard their occurrence should decrease pointing towards zero events. The present lack of data availability in the IMAP Integrated Monitoring and Assessment Programme (IMAP IS) for and relevant scientific studies does not allow for the proposal of a boundary limit between Good Environmental Status (GES) and non-GES status of CI 20. The boundary limit should primarily be based on the frequency of contaminants' occurrence. However, more substantial considerations need to be undertaken following the expected future availability of sufficient data reported by the Contracting Parties (CPs), in order to propose a GES–non-GES boundary limit. All relevant national and international practices need to be considered, along with gathering information on the cumulative impact of the contaminants on different seafood species and conducting calculations of daily/monthly intake and related risk analysis.	

Indicator Title	Common Indicator 20. Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood (EO9)
Policy documents General Policy documents Decision IG.21/3 (COP18,2013) on Ecosystems Approach including adopting definitions of Good Environmental Status (GES) and Targets (UNEP(DEPI)/MED IG.21/9). Decision IG.22/7 (COP19, 2016) on Integrated Monitoring and Assessment Programme (IMAP) of the Mediterranean Sea and Coast and Related Assessment Criteria (UNEP(DEPI)/MED IG.22/28). Decision IG.21/3 (COP18,2013) on Ecosystems Approach including adopting definitions of Good Environmental Status (GES) and Targets (UNEP(DEPI)/MED IG.21/9). Decision IG.22/7 (COP19, 2016) on Integrated Monitoring and Assessment Programme (IMAP) of the Mediterranean Sea and Coast and Related Assessment Criteria (UNEP(DEPI)/MED IG.22/28). Decision IG.25/1 (COP22, 2021) on UNEP/MAP Medium-Term Strategy 2022-2027. Decision IG.22/7 (COP19, 2016) on the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria. Decision IG.23/6 (COP20, 2017) on 2017 Mediterranean Quality Status Report. Decision IG.24/4 (COP21, 2019) on Assessment Studies. Decision 26/3 (COP23, 2023) on the 2023 Mediterranean Quality Status Report and a Renewed Ecosystem Approach Policy in the Mediterranean. Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (EU Marine Strategy Framework Directive and updates in 2010). Commission Directive (EU) 2017/845 amending Directive 2008/56/EC of the European Parliament and of the Council as regards the indicative lists of elements to be taken into account for the preparation of marine strategies Commission Decision (EU) 2017/848 laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardised methods for monitoring and assessment, and repealing Decision 2010/477/EU. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (and updated revisions). Commission Decision (EC) No 2013/480/EU establishing, pursuant to Directive 2000/60/EC of the European Parliament and of the Council, the values of the Member State monitoring system classifications as a result of the intercalibration exercise and repealing Decision 2008/915/EC. 2017 Mediterranean Quality Status Report, https://www.medqsr.org/node/10/ 2023 Mediterranean Quality Status Report, medqsr2023.info-rac.org UNEP(DEPI)/MED IG.22/Inf.7. (2016) Integrated Monitoring and Assessment Guidance Contaminants in Seafood related Policy documents Commission Regulation (EC) No 1881/2006 setting maximum levels for certain contaminants in foodstuffs. Commission Regulation (EC) No 835/2011 amending Regulation (EC) No 1881/2006 as regards maximum levels for polycyclic aromatic hydrocarbons in foodstuffs. Commission Regulation (EC) No 1259/2011, amending Regulation (EC) No 1881/2006 as regards	

Indicator Title	Common Indicator 20. Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood (EO9)
maximum levels for dioxins, dioxin-like PCBs and non-dioxin-like PCBs in foodstuffs. Commission Decision (EC) No 2013/480/EU establishing, pursuant to Directive 2000/60/EC of the European Parliament and of the Council, the values of the Member State monitoring system classifications as a result of the intercalibration exercise and repealing Decision 2008/915/EC. European Commission, E. (2018) Guidance Document No: 27. Technical Guidance For Deriving Environmental Quality Standards. Global Legally Binding Treaty (Minamata Convention on Mercury) http://www.mercuryconvention.org/ Joint FAO/WHO Expert consultation on the risk and benefits of fish consumption. FAO Fisheries and Aquaculture Report No. 978. ISSN 2070-6987. Rome, January, 2010. List of maximum levels for contaminants in foods set by the FAO/WHO Codex Alimentarius Commission can be found at ftp://ftp.fao.org/codex/Meetings/cccf/cccf7/cf07_INFe.pdf OSPAR Commission, 2013. Levels and trends in marine contaminants and their biological effects - CEMP Assessment Report 2012. Monitoring and Assessment Series, 2013 OSPAR Commission, 2013. Levels and trends in marine contaminants and their biological effects - CEMP Assessment Report 2012. Monitoring and Assessment Series, 2013 OSPAR 2017. https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/pressures-human-activities/contaminants/ OSPAR (2008) Co-ordinated Environmental Monitoring Programme (CEMP) Assessment Manual for contaminants in sediments and biota. OSPAR Commission No. 379/2008 UNEP(DEC)/MED WG.372/3. (2012) Approaches for definition of GES and setting targets for the pollution related ecological objectives in the framework of the ecosystem approach. (EO5: eutrophication, EP9: contaminants, EP10: marine litter, EO11: noise). UNEP/MAP WG.509/30 (2021). Monitoring Guidelines/Protocols for Sampling and Sample Preservation of Sea Food for IMAP Common Indicator 20: Heavy and Trace Elements and Organic Contaminants. Meeting of the MED POL Focal Points, Videoconference, 6-7 October 2021. UNEP/MAP WG.509/31 (2021). Monitoring Guidelines/Protocols for Sample Preparation and Analysis of Sea Food for IMAP Common Indicator 20: Heavy and Trace Elements and Organic Contaminants. Meeting of the MED POL Focal Points, Videoconference, 6-7 October 2021. UNEP/MAP WG.492/10/ Rev.2 (2021). Integration and Aggregation Rules for Monitoring and Assessment of (IMAP Pollution and Marine Litter Cluster). Meeting of the Ecosystem Approach Correspondence Group on Pollution Monitoring, Videoconference, 26-28 April 2021. UNEP/MAP WG. 533/Inf.3 (2022). Adjusted Background (Assessment) Concentrations (BC/BAC) for Common Indicator 17 and Upgraded Approach for Environmental Assessment Criteria (EAC) for IMAP Common Indicators 17, 18 and 20. Meeting of the Ecosystem Approach Correspondence Group on Pollution Monitoring, Videoconference, 27 and 30 May 2022. UNEP/MAP – MED POL (2022). UNEP/MED WG 533/10, Appendix VI. Data Standards and Data Dictionaries for IMAP Common Indicator 20. Meeting of the Ecosystem Approach Correspondence Group on Pollution Monitoring, Videoconference, 27 and 30 May 2022. US FDA http://www.fda.gov/Food/FoodborneIllnessContaminants/Metals/ucm115644.htm	
Indicator analysis methods	

Indicator Title	Common Indicator 20. Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood (EO9)
Indicator Definition Number of detected regulated contaminants* in commercial species. Proportion of detected regulated contaminants* exceeding regulatory limits. <u>Sub-indicators:</u> other relevant chemicals and emerging pollutants are recommended to be carried out on a country decision basis. *The list of all chemical and related parameters to be reported for IMAP CI 20 by the Contracting Parties is detailed in the Data Standards for IMAP CI 20. This list includes cadmium (Cd), mercury (Hg), lead (Pb), benzo(a)pyrene, and the sum of four polycyclic aromatic hydrocarbons (PAHs): benzo(a)pyrene, benz(a)anthracene, benzo(b)fluoranthene, and chrysene. It also includes the sum of dioxins (WHO-PCDD/F-TEQ), the combined sum of dioxins and dioxin-like PCBs (WHO-PCDD/F-PCB-TEQ), and the sum of six PCBs (ICES 6): PCB28, PCB52, PCB101, PCB138, PCB153, and PCB180. The concentration limits for regulated contaminants, as included in Data Standards and Data Dictionaries for IMAP CI 20, are provided in the section below titled <i>Statistical Analysis and Basis for Aggregation – Assessment Criteria</i>. Non-regulated contaminants may also be included in the IMAP CI 20 monitoring programme; however, concentration limits for these substances have not yet been established under EU legislation. Methodology for indicator calculation Number of detected contaminants: monitoring by national regulatory and inspection bodies through statistics and databases. Number of detected contaminants exceeding regulatory limits: monitoring by national regulatory and inspection bodies through statistics and databases. The detailed analytical procedure for the contaminants regulated under CI 20 and other related mandatory parameters, including sampling and sample transportation, analytical determination of indicators and sub-indicators, and data quality control are outlined in D-1. Monitoring Guidelines/Protocols for Sampling and Determination of Contaminants in Seafood.	
Indicator units Concentration values of contaminants expressed in appropriate units of measurement, mg/kg w.w.= metals, and µg/kg w.w. = non-metals, as defined in Data Standards for IMAP CI 20. Percentage (%) of detected regulated contaminants* exceeding regulatory limits out of the total number of measured contaminants.	
Data Confidence and uncertainties Up to 2023, the IAEA/MESL, in collaboration with the UNEP/MAP - MED POL, implemented 56 interlaboratory comparisons/proficiency tests for the analysis of trace elements and organic contaminants, as well as 64 training courses on the analysis of trace elements and organic contaminants in marine samples. Over 370 analytical laboratory practitioners have been trained at MESL. As of 2018, the scope of proficiency testing and training courses has been adjusted to meet the needs of Mediterranean laboratories in implementing monitoring programmes for trace elements (covering mandatory heavy metals – Cd, Hg, Pb, Cu in line with IMAP requirements, as well as additional elements such as Al, As, Co, Cr, Fe, Li, Mn, Ni, and Zn) and organic contaminants for IMAP Common Indicator 17 (covering mandatory organic contaminants including organochlorine	

Indicator Title	Common Indicator 20. Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood (EO9)
(OC) pesticides, polychlorinated biphenyl congeners (PCBs), and polycyclic aromatic hydrocarbons (PAHs), also in accordance with IMAP requirements). Designated national laboratories participating in the proficiency tests receive, along with the sample, clear instructions on how to proceed with the PT sample and how to report the results. They are requested to use established analytical methods and are recommended to apply quality control and laboratory quality assurance procedures. The results of analyses of a matrix-matching quality control (QC) sample must be reported along with the results from the PT sample. As of 2024, the scope of proficiency testing and training courses has been expanded to support the capacities of national laboratories in monitoring eutrophication (IMAP Common Indicators 13 & 14: inorganic nutrients in high salinity seawater, in estuarine and low salinity seawater, and chlorophyll a and Phaeopigments in Seawater) and contaminants in seafood (IMAP Common Indicator 20: heavy metals including the mandatory heavy metals – Cd, Hg, Pb, Cu, as well as additional elements such as Al, As, Co, Cr, Fe, Li, Mn, Ni, and Zn as specified for CI 17, polycyclic aromatic hydrocarbons (PAHs), dioxins, and PCBs).	
Methodology for monitoring, temporal and spatial scope	
Available Methodologies for Monitoring and Monitoring Protocols Building on elements elaborated in the Integrated Monitoring and Assessment Programme (2016 IMAP), the Monitoring Guidelines—structured around the specific technical protocols related to IMAP Common Indicator 20 were comprehensively developed by the MED POL Programme in cooperation with IAEA/MESL. These guidelines were approved by the MED POL Focal Points Meeting (2021). They build upon the knowledge and practices obtained over 40 years of MED POL monitoring implementation and recent publications, highlighting the current practices of the Contracting Parties' marine laboratories, as well as other Regional Seas Conventions and the EU. A thorough analysis of presently available practices of UNEP/MAP, UNEP and IAEA, as well the HELCOM, OSPAR and European Commission Joint Research Centre was undertaken to assist an innovative approach for preparation of the IMAP Monitoring Guidelines/Protocols. The monitoring methodologies and practices are elaborated for sampling, sample preservation and transportation, sample preparation and analysis, along with quality assurance and reporting of monitoring data, for their use by the IMAP competent laboratories in order to ensure the representativeness and accuracy of the analytical results. These guidelines present a summary of the best available known practices employed in marine monitoring by bringing integrated comprehensive analytical practices that can be applied in order to ensure the representativeness and accuracy of the analytical results needed for generation of quality assured monitoring data. The Monitoring Guidelines for IMAP Common Indicator 20 outline the following monitoring and reporting practices (https://www.iaea.org/about/organizational-structure/departments-of-nuclear-sciences-and-applications/division-of-iaea-environment-laboratories/marine-environmental-studies-laboratory/unep-map-med-pol-integrated-monitoring-and-assessment-programme-imap-monitoring-guidelines): ○ D-1. Monitoring Guidelines/Protocols for Sampling and determination of contaminants in seafood ○ E-1. Monitoring Guidelines/Protocols for Analytical Quality Assurance for IMAP Common Indicators 13, 14, 17, 18 and 20; ○ F-1. Monitoring Guidelines/Protocols for Reporting Monitoring Data for IMAP Common Indicators 13, 14, 17, 18 and 20.	
Available data sources i. IMAP Info System (http://imapinfosystem.info-rac.org/app/#/) – one dataset reported by one Contracting Party for CI 20, and data reported for contaminants in biota (CI 17);	

Indicator Title	Common Indicator 20. Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood (EO9)
ii. Recently reviewed literature, due to the absence of <i>in situ</i> data reported for CI 20, as elaborated in the CI 20 thematic assessment and the 2023 MED QSR Pollution Assessment The two additional potential data sources: iii. Data/reports that might be available from https://cdr.eionet.europa.eu/ (MSFD) that should be further discussed with EIONET; iv. Data that might be available at GFCM-FAO data base for the Mediterranean Sea.	
Spatial scope guidance and selection of monitoring stations Risk-based methodologies were used as much as possible in defining the scope of monitoring for IMAP Common Indicator 20, along with establishment of national monitoring networks. The D-1. Monitoring Guidelines/Protocols for IMAP CI 20 sets a detailed analytical procedure for sampling and determination of contaminants in seafood.	
Temporal Scope guidance Risk-based methodologies were used as much as possible in defining the scope of monitoring for IMAP Common Indicator 20, along with establishment of national monitoring networks. The temporal scope is highly linked to the data confidence and uncertainty of the indicator. Yearly statistics is would be the basic time period.	
Data analysis and assessment outputs	
Statistical analysis and basis for aggregation – Assessment Criteria Monitoring should allow the necessary statistical data treatments and long-term time-trend evaluations. 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. The Mediterranean EAC values for Common Indicator 20, as approved by the Meeting of CorMon Pollution (27 and 30 May 2022) (UNEP/MED WG.533/10, Annex III, Appendix 1), and adopted by Decision 26/3 (COP23, 2023) on the 2023 Mediterranean Quality Status Report and a Renewed Ecosystem Approach Policy in the Mediterranean, are presented here-below in Tables 1 to 3. They 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 UNEP/MAP – 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 1 to 3 show EAC CI 20 values for TM (Cd, Hg and Pb) and organic contaminants (PCBs, PAHs and dioxin). 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 1. 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	

Indicator Title	Common Indicator 20. Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood (EO9)
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metals in foodstuffs for the protection of human health, as provided in EC/EU Directives 1881/2006 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			
Matrix	TM, mg/kg wet wt		
	Cd	Hg	Pb
fish muscle	0.05-0.25	0.5-1	0.3
Cephalopods	1	1	1
Crustaceans	0.5	0.5	0.5
bivalve mollusk	1	1	1.5

Table 2. 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) 1881/2006. 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, benzo(a)anthracene, benzo(b)fluoranthene and 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 3. 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.).

Indicator Title	Common Indicator 20. Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood (EO9)
<i>Where fish are intended to be eaten whole, the maximum level shall apply to the whole fish.</i>	
Assessment of contaminants in seafood The previous assessment of IMAP Common Indicator 20, performed during the preparation of the 2017 Mediterranean Quality Status Report (2017 MED QSR), was based on bibliographic studies and scientific documents in the Mediterranean Sea. There were no data sets reported to MEDPOL for IMAP CI 20. In the 2017 MED QSR it was concluded that “ a few research studies and EU policy driven reports i.e., related to MSFD in some Mediterranean countries investigated the occurrence of contaminants in seafood from an environmental perspective i.e., the ecosystem approach, which are exceeding the maximum regulatory levels established within regulatory standards. Due to the lack of data reported in IMAP IS, it was not possible to implement the recommendations of COP 19 regarding integrated assessments based on quality-assured data. As a result, the input for the 2023 Mediterranean Quality Status Report (2023 MED QSR), related to the initial environmental assessment of CI 20, was developed using the following two approaches: The Environmental initial exemplary assessment of CI 20 based on data reported in IMAP IS for CI 17 contaminants in biota, further to the absence of <i>in situ</i> data reported for CI 20. CI 17 data for <i>M. galloprovincialis</i> were available only for the WMS and the ADR, and CI 17 TM data for <i>M. barbatus</i> were available for the ADR (56 data points), CEN (15 data points) and AEL (213 data points). The Environmental Assessment of CI 20 based on recent peer reviewed literature in the absence of <i>in situ</i> data reported in IMAP IS for CI 20, Examination of the literature data per sub-regions was performed by counting the number of times contaminants (Cd, Hg, Pb, B(a)P) and the number of group of contaminants (Σ4 PAHs, Σ6 PCBs, PCDD/Fs and Σ (PCDD/Fs and dl PCBs)) were addressed in the literature. There were 37 entries for the WMS, 25 for the ADR, 24 for the CEN and 23 for the AEL sub-region. Further details are provided in the thematic assessments of contaminants in seafood and the 2023 MED QSR Pollution Assessment.	
Known gaps and uncertainties in the Mediterranean As IMAP Common Indicator 20 is the new indicator within the IMAP implementation, its applicability beyond food consumer protection and public health was necessary to determin, although intuitively reflects the health status of the marine environment in terms of their delivery of benefits (e.g. fisheries industry). Thus, monitoring protocols, risk-based approaches, analytical testing and assessment methodologies would need to be further examined between Contracting Parties national food safety authorities, research organisations and/or environmental agencies. Further to the significant progress achieved over the last few biennia regarding the standardizing monitoring practices and progressing towards the environmental assessment tools—along with the improved availability of assessment criteria – it is essential to proceed by setting a multidisciplinary approach needed to ensure GES assessment for CI 20 . By building on the achievements up to 2023, during the preparation of the 2023 MED QSR, several knowledge gaps were identified in the monitoring and assessment of Common Indicator 20, which need to be addressed following the recommendations of the 2023 MED POL Focal Points Meeting. ○ A multidisciplinary approach will be essential to ensure the GES assessment for CI 20, by implementing priority actions aimed at addressing the existing gaps: Agree on the maximal	

Indicator Title	Common Indicator 20. Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood (EO9)	
percentage of detected regulated contaminants exceeding regulatory limits in seafood, above which non-GES needs to be assigned to the area assessed; ○ Incorporate the risk assessments to human health from consumption of seafood by calculating the estimated daily intake (EDI), the target hazard quotient (THQ), the total health risk (HI), and the cancer risk, among others; ○ Incorporate into the overall evaluation the suite of contaminants analyzed, together with other factors such as synergy among contaminants, and temporal and spatial scales. ○ Harmonize the choice of species among the CPs, whereby data from national reports on seafood safety and cooperation with national health authorities should be used to complement data reporting to IMAP IS; ○ Examine and coordinate monitoring protocols, risk-based approaches, analytical testing, and assessment methodologies between the CPs; the national food safety authorities; research organisations and/or environmental agencies; ○ Determine the applicability of CI 20 beyond food consumer protection and public health, although it intuitively reflects the health status of the marine environment in terms of delivery of benefits (e.g., fisheries industry).		
Contacts and version Date		
http://www.unepmap.org		
Version No	Date	Author
V.1	31.05.17	MED POL
V.2	12.12.18	MED POL
V.3	31/05/2019	Approved by the Meeting of MED POL FPs
Final version	09/09/2019	Approved by the 7 th Meeting of EcAp Coordination Group
V4	28/05/2025	Joint CorMon Pollution and ML Meeting
V5		Approved by the Meeting of MED POL FPs
Final version		Approved by the 12 th Meeting of EcAp Coordination Group

11. The revision of IMAP **Common Indicator 21 (EO9)**: “Percentage of intestinal enterococci concentration measurements within established standards” is presented in the table bellow.

Indicator Title	Common Indicator 21. Percentage of intestinal enterococci concentration measurements within established standards (EO9)	
Relevant GES definition	Related Operational Objective	Proposed Target(s)³¹
Concentrations of intestinal enterococci are within established standards	Water quality in bathing waters and other recreational areas does not undermine human health	Increasing trend in the percentage of intestinal enterococci concentration measurements that fall in the approved GES categories as

³¹ Following the decisions to be made at the present meeting regarding minor adjustments to the Targets, as outlined in working document UNEP/MED WG.624/3, the revised Targets will be incorporated into the revised IMAP Pollution Indicators Factsheets.

Indicator Title	Common Indicator 21. Percentage of intestinal enterococci concentration measurements within established standards (EO9)	
		established in Decision IG.20/9 and the EU 2006/7 Directive.
Rational		
Justification for indicator selection		
The Mediterranean Sea continues to attract every year an ever-increasing number of international and local tourists that among their activities use the sea for recreational purposes. The establishment of sewage treatment plants and the construction of submarine outfall structures have decreased the potential for microbiological pollution, despite major hotspots still exist. High levels of intestinal enterococci bacteria in recreational marine waters (coasts, beaches, tourism spots, etc) are known to be indicative of human pathogens, which is a serious public health concern, as well as economical. Therefore, intestinal enterococci concentrations are frequently used as a faecal indicator bacteria proxy or general indicators of faecal contamination in the marine environment. It has been suggested and later on demonstrated that <i>enterococci sp.</i> might be more appropriate than traditional <i>Escherichia coli</i> in marine waters as an index of faecal pollution. Currently, is the only faecal indicator bacteria recommended by the US Environmental Protection Agency (US EPA, 2012) for brackish and marine waters, since they correlate better than faecal coliforms or <i>E.coli</i>. The World Health Organization (WHO) is also in line with this approach (Ashbolt et al., 2001; Kay et al., 2004). Within the framework of Integrated Monitoring and Assessment Programme (UN/MAP IMAP) this indicator has been selected.		
Scientific References		
Ashbolt, N.J., Grabow, W.O.K, and Snozzi, M., 2001. Indicators of microbial water quality, Chapter 13. In: Water Quality: Guidelines, Standards and Health. 2001 World Health Organization (WHO). Edited by Lorna Fewtrell and Jamie Bartram. Published by IWA Publishing, London, UK. Cabelli VJ, Dufour AP, Levin MA, McCabe LJ, Haberman PW. 1979. Relationship of microbial indicators to health effects at marine bathing beaches. Am. J. Public Health, 69, 690–696 Byappanahalli, MN. <i>et al.</i>, 2012. Enterococci in the environment. Microbiol. Mol. Biol.Rev., 76, 685-706 Kay, D. et al, 2004. Derivation of numerical values for the World Health Organization guidelines for recreational waters. Water Research 38 (2004) 1296–1304 Kay D, <i>et al.</i> 1994. Predicting likelihood of gastroenteritis from sea bathing: results from randomised exposure. Lancet, 344, 905–909 Prüss A. 1998. Review of epidemiological studies on health effects from exposure to recreational water. Int. J. Epidemiol., 27, 1–9 US EPA RWQC 2012. Recreational Water Quality Criteria. OFFICE OF WATER 820-F-12-058. Scientific document.		
Policy Context and targets		
Policy context description		
The World Health Organisation (WHO) has been concerned with health aspects of the management of water resources for many years and published various documents concerning the safety of the water environment, including marine waters, and its importance for health. Revised Mediterranean guidelines for bathing water quality were formulated in 2007 based on the WHO guidelines for “Safe Recreational Water Environments” and on the EC Directive for “Bathing Waters” (EU/2006/7), and through Decision IG.20/9 (Criteria and Standards for bathing waters quality in the framework of the implementation of Article 7 of the LBS Protocol. COP17, Paris, 2012). The proposal was made in an effort to provide updated criteria and standards that can be used in the Mediterranean countries and		

Indicator Title	Common Indicator 21. Percentage of intestinal enterococci concentration measurements within established standards (EO9)
to harmonize their legislation in order to provide homogenous data. Therefore, the standards for bathing waters quality in the framework of the implementation of Article 7 of the LBS Protocol, could be further used to define GES for the indicator on pathogens in bathing waters.	
Targets The initial target of GES under Common Indicator 21 is an increasing trend in measurements to test that levels of intestinal enterococci comply with established national or international standards and the methodological approach itself. Particularly, under Decision IG.20/9 and the EU 2006/7 Directive, excellent (95th percentile < 100 CFU/100 mL) or good (95th percentile < 200 CFU/100 mL) quality categories for the “last assessment”; which means the last four years. Decision IG.20/9 on <i>Criteria and Standards for Bathing Water Quality</i>—adopted in the context of implementing Article 7 of the LBS Protocol (COP 17, Paris, 2012; UNEP/MAP, 2012)—established threshold values for bathing water quality in the Mediterranean region, as outlined in the referenced section. These threshold values were used in the preparation of the 2023 MED QSR bathing water quality assessment to define the boundary between Good Environmental Status (GES) and non-GES status in relation to pathogens in bathing waters. The assessment scale shown below was developed and applied across Mediterranean sub-regions to evaluate GES, where applicable. • A four-class assessment scale—Category A - Excellent, Category B - Good, Category C - Sufficient, category D - Poor/Immediate Action—is established in accordance with Decision IG.20/9 and the EU 2006/7 Directive. Categories A, B and C are considered to meet GES, while Category D is classified as non-GES for intestinal enterococci (IE) in Mediterranean bathing waters. • A threshold value for the GES / non-GES boundary is defined. The decision rule for GES/non-GES status is based on comparing assessment score values against the boundary limit value defined for Category D. • Bathing water classification is based on the 90th or 95th percentile of the log10 normal probability density function of microbiological data. Each location must have at least 16 data points collected over four bathing seasons, with a minimum of four samples per season with the interval between samplings does not exceed one month (exceptions are outlined in Directive 2006/7/EC and Decision IG.20/9).	
Policy documents General Policy documents Decision IG.21/3 (COP18,2013) on Ecosystems Approach including adopting definitions of Good Environmental Status (GES) and Targets (UNEP(DEPI)/MED IG.21/9). Decision IG.22/7 (COP19, 2016) on Integrated Monitoring and Assessment Programme (IMAP) of the Mediterranean Sea and Coast and Related Assessment Criteria (UNEP(DEPI)/MED IG.22/28). Decision IG.21/3 (COP18,2013) on Ecosystems Approach including adopting definitions of Good Environmental Status (GES) and Targets (UNEP(DEPI)/MED IG.21/9). Decision IG.22/7 (COP19, 2016) on Integrated Monitoring and Assessment Programme (IMAP) of the Mediterranean Sea and Coast and Related Assessment Criteria (UNEP(DEPI)/MED IG.22/28). Decision IG.25/1 (COP22, 2021) on UNEP/MAP Medium-Term Strategy 2022-2027. Decision IG.22/7 (COP19, 2016) on the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria. Decision IG.23/6 (COP20, 2017) on 2017 Mediterranean Quality Status Report.	

Indicator Title	Common Indicator 21. Percentage of intestinal enterococci concentration measurements within established standards (EO9)
Decision IG.24/4 (COP21, 2019) on Assessment Studies. Decision 26/3 (COP23, 2023) on the 2023 Mediterranean Quality Status Report and a Renewed Ecosystem Approach Policy in the Mediterranean. Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (EU Marine Strategy Framework Directive and updates in 2010). Commission Directive (EU) 2017/845 amending Directive 2008/56/EC of the European Parliament and of the Council as regards the indicative lists of elements to be taken into account for the preparation of marine strategies Commission Decision (EU) 2017/848 laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardised methods for monitoring and assessment, and repealing Decision 2010/477/EU. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (and updated revisions). Commission Decision (EC) No 2013/480/EU establishing, pursuant to Directive 2000/60/EC of the European Parliament and of the Council, the values of the Member State monitoring system classifications as a result of the intercalibration exercise and repealing Decision 2008/915/EC. 2017 Mediterranean Quality Status Report, https://www.medqsr.org/node/10/ 2023 Mediterranean Quality Status Report, medqsr2023.info-rac.org UNEP(DEPI)/MED IG.22/Inf.7. (2016) Integrated Monitoring and Assessment Guidance Bathing Waters related Policy documents Decision IG.20/9. Criteria and Standards for Bathing Waters Quality in the framework of the implementation of Article 7 of the LBS Protocol. (COP17, Paris, 2012). Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006L0007&from=EN UNE/MAP MED POL, 2010. Assessment of the state of microbial pollution in the Mediterranean Sea. MAP Technical Reports Series No. 170 (Amended). UNEP/MED WG.556/Inf.13/Rev.1. (2023), The Marine Environment Assessment in the Areas with Insufficient Data: The Results of Assessment for IMAP Common Indicator 21 in the Mediterranean.	
Indicator analysis methods	
Indicator Definition	
The concentration (Colony-forming unit, CFU) of intestinal enterococci in the water sample (normalised to 100 mL) collected at one beach location.	
Methodology for indicator calculation	
For the indicator calculation, the methodology was set by Directive 2006/7/EC with the specification outlined below:	

Indicator Title	Common Indicator 21. Percentage of intestinal enterococci concentration measurements within established standards (EO9)
Based upon percentile evaluation of the log10 normal probability density function of microbiological data acquired from the particular bathing water, the 90th and 95th percentile values are derived as follows: 1) Take the log10 value of all bacterial enumerations in the data sequence to be evaluated. (If a zero value is obtained, take the log10 value of the minimum detection limit of the analytical method used instead) 2) Calculate the arithmetic mean of the log10 values (μ). 3) Calculate the standard deviation of the log10 values (σ). The upper 90-percentile point of the data probability density function is derived from the following equation: upper 90-percentile = antilog ($\mu + 1,282 \sigma$). The upper 95-percentile point of the data probability density function is derived from the following equation: upper 95-percentile = antilog ($\mu + 1,65 \sigma$).	
Indicator units The 90th and 95th percentiles of the log10 normal probability density function of the CFU datasets measured at one single location according established monitoring and assessment protocols and standards.	
List of Guidance documents and protocols available ISO 7899-1 [Water quality – Detection and enumeration of intestinal enterococci: Part 1: Miniaturized method (Most Probable Number) for surface and wastewater] ISO 7899-2 [Water quality – Detection and enumeration of intestinal enterococci: Part 2: Membrane filtration method]. WHO Guidelines for Safe Recreational Water Environments. Volume 1: Coastal and fresh waters, 2003. WHO Guidelines for Safe Recreational Water Environments Recreational Water Environments. Volume 2: Swimming Pools and Similar Environments, 2006. Revised Mediterranean guidelines for bathing waters based on the WHO guidelines for Safe Recreational Water Environments and on the EC Directive for Bathing Waters” (EU/2006/7), and Decision IG.20/9 on Criteria and Standards for Bathing Water Quality in the framework of the implementation of Article 7 of the LBS Protocol, 2007. European Environment Agency (EEA). European Topic Centre on Inland, Coastal and Marine Waters, 2021.	
Data Confidence and uncertainties As in the case of analytical chemistry, the data confidence originates in the maintenance of internal QA/QC programmes by national laboratories, as well as regular interlaboratory or proficiency testing exercises. It should be mentioned that the level of uncertainty in measurements could be considered low, provided the above is fulfilled. On the other hand, the ISO 7899-2 methodology describes the isolation of intestinal enterococci (<i>Enterococcus faecalis</i>, <i>E. faecium</i>, <i>E. durans</i> and <i>E. hirae</i>), pointing out that, other Enterococcus species and some species of the genus Streptococcus (namely <i>S. bovis</i> and <i>S. equinus</i>) may occasionally be detected. These Streptococcus species do not survive long in water and are probably not enumerated quantitatively. Further, for purposes of water examination, <i>enterococci sp.</i> can be regarded as indicators of faecal pollution, despite it should be mentioned that some enterococci found in water can occasionally also originate from other habitats.	
Methodology for monitoring, temporal and spatial scope	

Indicator Title	Common Indicator 21. Percentage of intestinal enterococci concentration measurements within established standards (EO9)
Available Methodologies for Monitoring and Monitoring Protocols	
Revised Mediterranean guidelines for bathing waters were formulated in 2007 based on the WHO guidelines for “Safe Recreational Water Environments” and on the EC Directive for “Bathing Waters” (EU/2006/7), and through Decision IG.20/9 on Criteria and Standards for Bathing Water Quality in the framework of the implementation of Article 7 of the LBS Protocol (COP17, Paris, 2012). The proposal was made in an effort to provide updated criteria and standards that can be used in the Mediterranean countries and to harmonize their legislation in order to provide homogenous data.	
Available data sources	
i. IMAP Info System (http://imapinfosystem.info-rac.org/app/#/); ii. The European Environment Agency (EEA) (https://www.eea.europa.eu/data-and-maps/indicators/bathing-water-quality; https://www.eea.europa.eu/themes/water/europes-seas-and-coasts/assessments/state-of-bathing-water/state-of-bathing-waters-in-2020).	
Spatial scope guidance and selection of monitoring stations	
Sampling should be performed in recreational waters where microbiological pollution could threat the recreational uses. The measurements are made in selected monitoring stations during the bathing seasons and other sites of concern. The full description of indications to prepare a monitoring strategy is outlined in Directive 2006/7/EC concerning the management of bathing water quality.	
Temporal Scope guidance	
According to EU Directive 2006/7EC (Annex IV) and Decision IG.20/9, the temporal scope guidance is as follows:	
1. One sample is to be taken shortly before the start of each bathing season. Taking account of this extra sample and subject to paragraph 2 (below), no fewer than four samples are to be taken and analysed per bathing season. 2. However, only three samples need be taken and analysed per bathing season, as detailed in the below section on the assessment, in the case of a bathing water that either: (a) has a bathing season not exceeding eight weeks; or (b) is situated in a region subject to special geographical constraints. 3. Sampling dates are to be distributed throughout the bathing season, with the interval between sampling dates never exceeding one month. 4. In the event of short-term pollution, one additional sample is to be taken to confirm that the incident has ended. This sample is not to be part of the set of bathing water quality data. If necessary to replace a disregarded sample, an additional sample is to be taken seven days after the end of the short-term pollution.	
Data analysis and assessment outputs	
Statistical analysis and basis for aggregation – Assessment Criteria	
Decision IG.20/9 on Criteria and Standards for Bathing Water Quality—adopted in the context of implementing Article 7 of the LBS Protocol (COP 17, Paris, 2012)— agreed on the threshold values in the Mediterranean region as presented in below table.	
Microbial Water Quality Assessment Category based on Intestinal enterococci (cfu/100 mL) in bathing waters in the Mediterranean (Decision IG.20/9).	
Category	A B C D

Indicator Title		Common Indicator 21. Percentage of intestinal enterococci concentration measurements within established standards (EO9)			
Limit values	<100*	101-200*	185**	>185**(1)	
Water Quality	Excellent	Good	Sufficient	Poor/Immediate Action	

*Based on the 95th percentile; ** Based on the 90th percentile;

- (1) For single sample appropriate action is recommended to be carried out once the count for IE exceeds 500 cfu/100 mL;
- For classification purposes at least 12 sample results are needed spread over 3-4 bathing seasons; Exceptions related to the assessment of monitoring data are outlined in Directive 2006/7/EC and Decision IG.20/9, as detailed in the following section on assessment outputs.
- Reference method of analysis: ISO 7899-2 based on membrane filtration technique or any other approved technique;
- Transitional period 4 years (starting by 1st January 2012).

Monitoring should allow the necessary statistical data treatments, as well as time-trend evaluations. While considering the IMAP nested for presentation of the assessment findings, the balance between data, locations and spatial resolution should be carefully considered for coherence in areas, as CI 21 is assessed in coastal waters

Assessment of Bathing Water Quality For pathogenic microorganisms in bathing water, monitoring for the assessment of GES could be carried out on a sub-regional and/or local level due to the nature of microbiological contamination (the impact is restricted to a relatively short distance from the pollution source due to the short survival time of microorganisms in seawater and dilution effects). Distribution maps and short-term temporal trend assessments should also be utilized.

Due to insufficient data reported in the IMAP Information System (IMAP IS), the full implementation of the COP 19 recommendations on integrated assessments based on quality-assured data was not possible. Consequently, the input related to the environmental assessment of Common Indicator 21 (CI 21) for the 2023 Mediterranean Quality Status Report (2023 MED QSR) was developed upgrading the approach applied in the 2017 MED QSR. This approach combined assessment results from nine Contracting Parties, as presented in the EEA 2020 State of Bathing Water Quality report (<https://www.eea.europa.eu/themes/water/europes-seas-and-coasts/assessments/state-of-bathing-water/state-of-bathing-waters-in-2020>), with the evaluation of monitoring data reported for CI 21 in IMAP Info System by five Contracting Parties.

The methodology used in the EEA's 2020 assessment of bathing water quality followed the EEA Guidelines for assessments under the Bathing Water Directive. This approach is consistent with the requirements of Directive 2006/7/EC and IMAP Decision IG.20/9. Specifically, bathing waters were classified based on the 90th or 95th percentile values derived from the log₁₀ normal probability density function of microbiological data. Each monitoring location included a minimum of 16 samples collected over four bathing seasons, with at least four samples per season.

Exceptions to this standard are outlined in Directive 2006/7/EC and Decision IG.20/9. In brief, assessments may be conducted using data from three bathing seasons if the bathing water is newly designated or if significant changes have occurred that could affect its classification. The dataset must still include at least 16 samples in such cases. Under special circumstances—such as when the bathing season lasts no longer than eight weeks or when the site is located in a region with particular geographical constraints—only 12 samples may be used (as stipulated in Annex IV, paragraph 2 of the Directive).

The Directive defines two key microbiological indicators: *Intestinal enterococci* (IE) and *Escherichia coli* (E. coli), both measured in colony-forming units per 100 ml (cfu/100 ml). The final classification of bathing waters is determined by the lower status of the two indicators. For instance, if the water quality for IE is classified as "excellent" but the E. coli level is "poor," the overall classification for the site is "poor."

Indicator Title	Common Indicator 21. Percentage of intestinal enterococci concentration measurements within established standards (EO9)																
The same methodology used in the EEA 2020 assessment of bathing water quality was applied to the dataset reported in the IMAP Info System by three Contracting Parties, using intestinal enterococci as the sole indicator. However, this methodology could not be applied to data from two other Contracting Parties, as the required 16 data points over four consecutive bathing seasons were not available. For these two Contracting Parties, classification was instead based on the geometric mean calculated for each location. The geometric mean was chosen because it minimizes the impact of outliers and is less affected by skewed data distributions compared to the arithmetic mean. The table below compares the two methodologies. Comparison between the methodology used by the EEA and the methodology used in present document for the assessment of Bathing waters quality (CI-21) <table><tr><td>Assessment methodology</td><td>EEA</td><td>Present assessment of IMAP CI 21*</td></tr><tr><td>Assessment Category</td><td>Based on Intestinal enterococci and Escherichia coli (cfu/100 mL)</td><td>Based on Intestinal enterococci (cfu/100 mL)</td></tr><tr><td>Number of data points</td><td>At least 16</td><td>Less than 16, depending on the CP</td></tr><tr><td>Number of monitoring years</td><td>4</td><td>Less than 4, depending on the CP</td></tr><tr><td>Classification of station</td><td>Percentile evaluation of the log10 normal probability density function</td><td>Geometric mean</td></tr></table> Further details are provided in the thematic bathing waters assessments and the 2023 MED QSR Pollution Assessment.			Assessment methodology	EEA	Present assessment of IMAP CI 21*	Assessment Category	Based on Intestinal enterococci and Escherichia coli (cfu/100 mL)	Based on Intestinal enterococci (cfu/100 mL)	Number of data points	At least 16	Less than 16, depending on the CP	Number of monitoring years	4	Less than 4, depending on the CP	Classification of station	Percentile evaluation of the log10 normal probability density function	Geometric mean
Assessment methodology	EEA	Present assessment of IMAP CI 21*															
Assessment Category	Based on Intestinal enterococci and Escherichia coli (cfu/100 mL)	Based on Intestinal enterococci (cfu/100 mL)															
Number of data points	At least 16	Less than 16, depending on the CP															
Number of monitoring years	4	Less than 4, depending on the CP															
Classification of station	Percentile evaluation of the log10 normal probability density function	Geometric mean															
Known gaps and uncertainties in the Mediterranean																	
Building on the significant progress made over recent biennia in standardizing monitoring practices and advancing environmental assessment tools, it is essential to ensure a robust Good Environmental Status (GES) assessment for Common Indicator 21 (CI 21). This requires strengthening data reporting to enhance the reliability and confidence of the assessment. To apply the uniform assessment methodology consistently across the Mediterranean, a minimum of 16 data points over four consecutive bathing seasons is required. This will significantly improve the comparability and consistency of the assessment findings.																	
Contacts and version Date																	
http://www.unepmap.org																	
Version No	Date	Author															
V.1	31.05.17	MED POL															
V.2	12.12.18	MED POL															
V.3	29.04.19	MED POL															
Final version	31/05/2019	Approved by the Meeting of MED POL FPs															
V4	28/05/2025	Joint CorMon Pollution and ML Meeting															
V5		Approved by the Meeting of MED POL FPs															
Final version		Approved by the 12 th Meeting of EcAp Coordination Group															

Updated Guidance Factsheets for IMAP EO 11 (Candidate Common Indicators 26 and 27)

1 Introduction

12. This document presents the revised Guidance Factsheets for IMAP Candidate Common Indicators 26 and 27 in accordance with Decision IG.26/3 (COP 23, 2023) concerning the 2023 Mediterranean Quality Status Report (MED QSR) and the Renewed Ecosystem Approach Policy in the Mediterranean.

13. The current revision builds upon achievements endorsed for the preparation of the 2023 Mediterranean Quality Status report (2023 MED QSR) by the 2023 Meetings of MED POL Focal Points and the Integrated Ecosystem Approach Correspondence Group. It also responds to the request of 2019 Meeting of MED POL Focal Points for further elaboration of IMAP Guidance Factsheets for IMAP Candidate Common Indicators 26 and 27 to incorporate evolving scientific knowledge.

14. These foundational achievements determining the revision of the IMAP Guidance Factsheets for Candidate Common Indicators 26 (impulsive noise) and 27 (continuous noise) include:

a) Development, Testing, and Implementation of Initial GES Assessment Methodologies for Impulsive and Continuous Noise

i. Assessment methodologies were established for evaluating IMAP Candidate Common Indicators 26 and 27 within the preparation of the 2023 Mediterranean Quality Status Report (MED QSR). These methodologies were developed based on the work of the EU Technical Group on Underwater Noise, with contributions from ACCOBAMS and UNEP/Map-SPA/RAC.

ii. Specifically, the assessment methodology applied in the 2023 MED QSR and included in the IMAP Guidance Factsheets indicates:

- For IMAP Candidate Common Indicator 26, threshold levels should be applied to the percentage of habitat occupied by noise-sensitive species affected by impulsive noise events, following a risk-based approach.
- For IMAP Candidate Common Indicator 27, a single threshold should be applied to the percentage of habitat of noise-sensitive species affected by continuous noise.

b) Strengthening Assessment Criteria, including:

i. Establishment of threshold values to maintain Good Environmental Status (GES) for both short-term and long-term exposure to impulsive noise events.

ii. Definition of a single threshold to maintain GES for exposure to continuous noise events.

iii. Classification of GES and non-GES status based on the application of these thresholds in noise assessments.

iv. Updating of statistical analyses and temporal scopes to support assessment methodologies for IMAP Candidate Common Indicators 26 and 27.

c) Incorporation of New Scientific and Policy Developments

Advancements since 2019 have been integrated to support the aforementioned achievements in IMAP noise assessments, as requested by the 2019 Meeting of MED POL Focal Points.

4. Guidance Factsheet on IMAP Candidate Common Indicators 26 and 27

15. The revision of IMAP **Candidate Common Indicator 26 (EO11)**: “Proportion of days and geographical distribution where loud, low and mid-frequency impulsive sounds exceed levels that are likely to entail significant impact on marine animals” is presented in the table below.

Indicator Title	Candidate Common indicator 26: Proportion of days and geographical distribution where loud, low and mid-frequency impulsive sounds exceed levels that are likely to entail significant impact on marine animals	
Relevant GES definition³²	Related Operational Objective	Proposed Target(s)³³
Noise from human activities causes no significant impact on marine and coastal ecosystems	Energy inputs into the marine environment, especially noise from human activities, are minimized	State: The extent (%) of habitat of noise-sensitive species within the assessment area that is impacted by impulsive noise events for a limited amount of time is below thresholds.
Rationale		
Justification for indicator selection Anthropogenic energy introduced by human activities into the marine environment includes sound, light and other electromagnetic fields, heat and radioactive energy. The most widespread and pervasive is underwater sound (Dekeling et al., 2014). Sound energy input can occur at varying spatial and temporal scales. Anthropogenic sounds may be of short duration (i.e. impulsive) or be long lasting (i.e. continuous). Lower frequency sounds can be transmitted far (tens to thousands of kilometres), whereas higher frequency sounds transmit less well in the marine environment (hundreds of meters to few kilometres (Urlick, 1996). Most common sources of marine noise pollution in the Mediterranean Sea include ship traffic, geophysical exploration and oil and gas exploitation, military and civil sonar use and underwater detonations, scientific research involving the use of active acoustic sources, and offshore and inshore industrial construction works (ACCOBAMS 2016; ACCOBAMS al., 2022). Marine organisms can be adversely affected both on short and long timescales (and include acute or chronic impact and temporary or permanent effects (Richardson et al, 1995). Adverse effects can be subtle (e.g. temporary reduction in hearing sensitivity, stress effects causing reduced immunity, reproduction success or survival), or more obvious (e.g. injury, death). The former may be difficult to observe and evaluate while the latter may in some circumstances be related to acute short-range noise exposures. There is a robust base of scientific evidence with regards to the effects of underwater impulsive noise on marine fauna, and especially cetaceans. Cetaceans' reliance on sound for communication, foraging, mating, and navigation makes them ideal indicators of acoustic disturbance. It has been demonstrated indeed those naval exercises involving the use of mid-frequency active sonars that are related to mass stranding events of cetaceans and especially Cuvier's beaked whales. Furthermore, geophysical surveys, pile driving and other loud impulsive noise signals have been correlated to a wide range of negative behavioural and physiological effects in fin whales and other baleen whales, sperm whales, different species of beaked whales, pilot whales and more. (e.g.: Benhemma-Le Gall et al., 2021; Blackwell et al., 2015; Borsani et al., 2008; Carroll et al., 2017; Castellote et al., 2012; Deruiter et al., 2013; Filadelfo et al., 2009; Frantzis, 1998; Goldbogen et al., 2013; Gomez et al., 2016; Isojunno et al., 2020; Parsons, 2017; Sciacca et al., 2016; Southall et al., 2013, 2019; Tougaard et al., 2013; Tyack & Thomas, 2019; Weir, 2008). Management concern is primarily associated to the negative effects of noise on sensitive protected species, such as some species of marine mammals.		

³² Following the decisions to be made at the present meeting regarding the GES definition and minor adjustments to the Targets, as outlined in working document UNEP/MED WG.626/3/Rev.1, the revised Targets and GES definition will be incorporated into the revised IMAP Pollution Indicators Factsheets.

³³ ibidem

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Policy Context and Targets

Policy context description

Generalities:

In the marine environment, the term pollution is defined in several legal frameworks by the following statement: “the introduction by man, directly or indirectly, of substances or energy into the marine environment [...]”. This definition includes anthropogenic noise as a form energy caused by human activities. As such, underwater noise pollution is addressed by Regional Seas Conventions, where the following initiatives are considered the most relevant for the management of activities generating noise, and the mitigation of their adverse effects on the marine environment:

1. For the Barcelona Convention, the Ecosystem Approach process (EcAp), started in 2008;
2. For the OSPAR and HELCOM Conventions, the adoption for their respective monitoring and assessment processes of the indicators related to underwater noise as proposed in the framework of the MSFD (2011 and 2012).

In parallel, the European Union adopted the same definition of pollution given in the paragraph above in the Marine Strategy Framework Directive (MSFD, 2008/56/EC, adopted in 2008).

With regards to the MSFD, underwater noise is addressed by Descriptor 11, and two criteria were selected for monitoring and assessment purposes, one addressing loud impulsive signals produced by several coastal and offshore works (pile driving, explosions, seismic pulses, etc.), the other targeting the contribution of anthropogenic sources, especially shipping, to ambient noise levels. Since the adoption of the MSFD (2008), the European Commission issued two Decisions addressing methodological standards for the monitoring and assessment of underwater noise: Commission Decision 2010/477/EU on criteria and methodological standards on good environmental status of marine waters, and Commission Decision 2017/848/EU laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardised methods for monitoring and assessment, and repealing Decision 2010/477/EU.

Concerning the EcAp process, among the eleven IMAP Ecological Objectives (EOs), and respective operational objectives and indicators agreed through Decision 20/4 (COP 17, Paris, 2012), EO11 addresses underwater noise produced by human activities. However, Decision 21/3 ((COP18, Istanbul, 2013) provided a specific list of descriptions of good environmental status and targets for the other EOs, contrary to EO11, considered not yet sufficiently understood to allow a proper definition of good environmental status.

Therefore, in the period 2014-2015 ACCOBAMS in cooperation with the UNEP/MAP Secretariat developed the “Basin-wide Strategy for underwater noise monitoring in the Mediterranean” thanks to its working group on noise (Joint ASCOBANS/ACCOBAMS/CMS Noise Working Group). This strategy proposed to address two types of noise for the monitoring and assessment purposes, as for the MSFD process: loud impulsive signals produced by coastal and offshore works (especially pile driving, explosions, seismic pulses and sonar), and the contribution of anthropogenic sources, especially shipping, to ambient noise levels. The strategy was included in the Integrated Monitoring and Assessment Programme (IMAP) by the Integrated CORMON Meeting i (Athens, 30 March– 1 April, 2015), which was finally adopted during the COP19 (Athens, 2016). Also, the COP19 assigned to ACCOBAMS the issues related to underwater noise based on the Memorandum of Understanding signed between ACCOBAMS and UNEP/MAP with the aim of strengthening the cooperation between the two organisations to move forward with the implementation of EO11.

After 2016, several initiatives have been undertaken by ACCOBAMS, including the participation to European projects (QUIETMED in the period 2017-2018, QUIETMED-2 in the period 2019-2020,

and QUIETSEAS in the period 2021-2022), the execution of dedicated studies, the implementation of monitoring programs, the contribution to the development of technical guidance relative to both EcAp and the EU-MSFD, and finally the coordination of the first basin-wide assessment of underwater noise pollution relative to EO11 under the scope of the 2023 Mediterranean Quality Status Report, (2022-2023).

Several other legal frameworks have addressed anthropogenic underwater noise and its impact on the marine environment and wildlife: The International Whaling Commission (IWC), the Convention on Biological Diversity (CBD), the Convention on Migratory Species (CMS), ASCOBANS, and more. Almost all the initiatives undertaken by such legal frameworks deal with the impact of noise on some environmental element (usually sensitive marine fauna such as cetaceans and fish, turtles, crustaceans, etc.), and mitigation measures related to single industrial activities. The novelty of the MSFD and EcAp processes is that the emphasis is put on the status of the ecosystem and hence on the cumulative impact of all human activities occurring in the maritime space.

With specific regards to impulsive noise:

In EU Member States, human activities producing loud impulsive signals into the marine environment are managed nationally through licensing systems, and the consideration of the impact of noise in such management processes is especially due to the European Directive on the Environmental Impact Assessment (EIA Directive). However, the EIA Directive is “project-based”, contrarily to the MSFD and EcAp, which are “ecosystem-based”. The main difference between project-based and ecosystem-based approach is that in the case of an EIA, the project developer (e.g. an industry) is responsible for assessing and mitigating the impact of its own activities, while in the case of the EcAp and MSFD processes, countries’ governments are responsible for the achievement and/or maintenance of the good environmental status, which include addressing and managing the potential adverse impact of all pressures in the marine environment.

The transposition in national legislation of the EIA Directive resulted in different national management systems. For instance, in the UK a standard mitigation framework applies to a list of well-defined

activities; in Germany, impulsive sound signals are allowed as far as they do not exceed legal thresholds (a certain received noise level at 750 m from the source); in Italy the project developer need to implement 60 days monitoring before and after the activity to understand whether or not the activity caused any impact.

Again, while the EIA Directive gave considerable results in managing the impact of single activities introducing noise into the sea, a framework addressing the ecosystem scale has been in need of development in the past decades. This Factsheet addresses exactly this point and provides the required methodological elements for the monitoring and assessment of underwater impulsive noise and hence the implementation of the ecosystem approach to the management of activities producing impulsive noise.

Targets

The primary activity under IMAP Candidate Common Indicator 26 should be the setting up by country of a database (“a noise register³⁴”) for the registration of “noise events”, where a noise event is the occurrence of loud impulsive signals (in low and mid frequency bands) on a given day and in a given place. [Upon building the register, which includes information on the number of impulsive noise events associated with activity – for example, in the case of pile driving - the number of strikes performed daily, or in the case of explosions – the number of explosions occurring daily,] it is possible to obtain an overview of the spatial and temporal distribution of noise-producing activities. Furthermore, by including information about the habitat of noise-sensitive species, it is possible to move towards the assessment of whether the risk of the negative impacts occurring on populations of such species is acceptable.

³⁴ See for example: <http://underwaternoise.ices.dk/map.aspx> ; <https://quietseas.ctnaval.com/>

Therefore, a threshold system was tested to define the acceptable risk level related to the occurrence of impulsive noise events within the 2023 MED QSR.

The initial threshold system is based on the impulsive noise assessment methodology outlined in the 2023 MED QSR which was accepted by the Integrated Meeting of the Ecosystem Approach Correspondence Groups (27-28 June 2023, Athens, Greece) and the Meeting of the MAP Focal Points (12-15 September 2023, Istanbul, Türkiye). The MED QSR 2023 impulsive noise methodology is in turn based on previous activities carried out by ACCOBAMS and UNEP/MAP - SPA/RAC under the QUIETMED and QUIETSEAS projects (Azzellino et al., 2021; Maglio et al., 2020; Maglio, Frey, et al., 2018) as well as by the European Commission technical group on underwater noise (Sigray et al., 2023).

The thresholds are applied to the % of habitat of noise-sensitive species which is affected by impulsive noise events. To achieve or maintain the Good Environmental Status, the following thresholds should be applied as follows:

3. **For short-term exposure (1 day, i.e., daily exposure)**, the maximum proportion of a habitat area utilized by a species of interest that is accepted to be exposed to impulsive noise levels higher than the Level of Onset of Biological Effects (LOBE)³⁵, over 1 day, is 20% or lower ($\leq 20\%$).
4. **For long-term exposure (1 year)**, the average exposure is calculated. The maximum proportion of a habitat area (calculated as the mean of the daily proportions over one year) utilized by a species of interest that is accepted to be exposed to impulsive noise levels higher than LOBE, over 1 year on average, is 10% or lower ($\leq 10\%$).
5. These threshold values were used for the initial impulsive noise assessment within the 2023 Mediterranean Quality Status Report.

The thresholds are given as a range (X% or lower) in order to take regional and sub-regional specificities into account. According to the setup and purposes of the assessment, a single thresholds value is picked up within the given ranges. Hence, threshold levels lower than 10% and 20% can be set according to local or regional specificities.

Policy documents

ACCOBAMS Resolution 7.13 - Anthropogenic Noise. ACCOBAMS-MOP7/2019/Doc38/Annex15/Res.7.13. 2019

ACCOBAMS Resolution 8.17 - Anthropogenic Noise. ACCOBAMS-MOP7/2019/Doc38/Annex15/Res.7.13. 2023

Commission Decision 2017/848/EU of 17 May 2017 laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardised methods for monitoring and assessment, and repealing Decision (2010/477/EU)

Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment; and successive amendments in 1997 (97/11/EC), 2003 (2003/35/EC), and 2009 (2009/31/EC). This Directive was repealed and replaced by the following: Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment; also amended in 2014 (2014/52/EU).

³⁵ The LOBE level, meaning Level of Onset of Biological Effect, is expressed in suitable sound metrics (e.g., sound pressure level or sound exposure level) and should be defined under the guidance of national and/or regional expert groups.

Decision IG.21/3 (COP18,2013) on Ecosystems Approach including adopting definitions of Good Environmental Status (GES) and Targets (UNEP(DEPI)/MED IG.21/9).

Decision IG.22/7 (COP19, 2016) on Integrated Monitoring and Assessment Programme (IMAP) of the Mediterranean Sea and Coast and Related Assessment Criteria (UNEP(DEPI)/MED IG.22/28).

Decision IG.25/1 (COP22, 2021) on UNEP/MAP Medium-Term Strategy 2022-2027.

Decision IG.22/7 (COP19, 2016) on the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria.

Decision IG.23/6 (COP20, 2017) on 2017 Mediterranean Quality Status Report.

Decision IG.24/4 (COP21, 2019) on Assessment Studies.

Decision 26/3 (COP23, 2023) on the 2023 Mediterranean Quality Status Report and a Renewed Ecosystem Approach Policy in the Mediterranean.

Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive).

Indicator analysis methods

Indicator Definition

The indicator is defined by the number of days and the spatial extent with impulsive sound sources in an assessment area and over a defined period. Such areas may be the cells of a spatial grid, or larger scale areas such as the subdivision, the sub-regional and the whole region. Not all impulsive noise sources are to be accounted for, only those exceeding minimum levels are considered to have a significant impact on populations of sensitive wildlife. The impact is considered significant when severe displacement of animals from their habitats occurs due to noise. Noise levels inducing the onset of significant impact are defined in the “Basin-wide Strategy for Underwater Noise Monitoring in the Mediterranean” (ACCOBAMS, 2015) and are still considered valid. The values as provided in this document need to be used to decide whether new noise event should or not be registered in the noise register. This definition was applied for the initial impulsive noise assessment in the 2023 MED QSR. It concerns the quantities considered for monitoring the pressure on the marine environment from underwater impulsive noise.

Methodology for indicator calculation

The calculation is given by:

The geographical extent of the occurrence of noise events, and the sum of all non-overlapping days of such noise events, over a defined period (one year or temporal window such as month or trimester), and for an assessment unit (for example a grid cell in a spatial grid, a sub-division, sub-region, region).

A spatial grid with a regular cell size is proposed to compute the number of days with impulsive sound sources. The calculation is done for each grid cell using common GIS software or more sophisticated web applications. Also, the calculation may be done in single assessment units or per sub-regions, region, or subdivisions decided at the country level.

The “Basin-wide Strategy for Underwater Noise Monitoring in the Mediterranean” (ACCOBAMS, 2015) proposed to use of a 20x20 km spatial grid. However, recent developments (especially the results of the QUIETMED project) led to the proposal of different options, including: the spatial grid already used by the General Fisheries Commission for the Mediterranean (GFCM statistical rectangles), which has a dimension of 30 min in latitude and longitude, or the adoption for all noise

sources of spatial grids already used by countries to manage human activities nationally (e.g. Oil&Gas licenced areas).

Indicator units

For the spatial aspect:

1. The daily proportion of the assessment area (%) which is covered by noise events, taking the sum of the area of each grid cell considered as impacted by noise events
2. The average proportion (%) over 1 year, i.e., the sum of all the daily proportions divided by 365(6)

For the temporal aspect: The sum of all non-overlapping days of occurrence of impulsive noise events in a unit area and in a given period³⁶.

List of Guidance documents and protocols available

A basin-wide strategy for underwater noise monitoring in the Mediterranean. Report prepared by Alessio Maglio, Manuel Castellote and Gianni Pavan. (ACCOBAMS, 2015)

End Report on GES criteria assessment at basin scale with focus on the consistency and coherence of approaches at national levels (including operational targets definition) - Deliverable 2.3 (Maglio, Frey, et al., 2018)

Joint proposal of a methodology to establish thresholds for impulsive noise in the Mediterranean Sea Region. QUIETMED2 D5.1. GA No. 110661/2018/794481/SUB/ENV.C2, (2021) -63pp (Azzellino et al., 2021)

Methodological framework for regional and sub- regional risk-based assessment for impulsive noise in the Mediterranean region. QUIETMED2 – D4.1. (Maglio et al., 2020)

Monitoring Guidance for Underwater Noise in European Seas, Part II: Monitoring Guidance Specifications, JRC Scientific and Policy Report EUR 26555 EN, Publications Office of the European Union, Luxembourg, 2014b, doi: 10.2788/27158. (Dekeling et al., 2014)

Recommendations to Member States to set up the national registers of impulsive noise according to criterion D11C1 of the Commission Decision 2017/848/EU and ACCOBAMS premises, and generalisation for the EcAp process. Deliverable 3.4, QUIETMED project. (Maglio, Salivas, et al., 2018)

Setting EU Threshold Values for impulsive underwater sound Technical Group on Underwater Noise (TG NOISE) MSFD Common Implementation Strategy. <https://doi.org/10.2760/60215> (Sigray et al., 2023).

Data Confidence and uncertainties

Data confidence is expected to be high due to the simplicity of the data themselves. To meet minimum objectives of Candidate Common Indicator 26 monitoring, only the location (geographical coordinates or area), the period (dates) and intensity of noise sources used are necessary. All such information, including the intensity of the noise source, should be obtained from declarative data, i.e. it is not necessary to measure the real noise level with any equipment, or to carry out fieldwork to locate noise-producing activities.

Declarative data can be sought in the national institutes already centralising data on marine activities (e.g. institutions managing Oil & Gas licensing procedures; or environmental impact assessment

³⁶ This definition was formerly called *pulse-block days* (PBDs).

procedures; etc.). This system, on the one hand result in very low costs for obtaining data, while in the other hand add some uncertainty.

Uncertainty is mainly due to the fact that declarative data may not be available (e.g. sensitive data such as data on military activities), not well specified or with important gaps, or not completely suitable for impulsive noise monitoring as described in this Factsheet.

Methodology for monitoring, temporal and spatial scope

Available Methodologies for Monitoring and Monitoring Protocols

Monitoring Methodology: A register of the use of noise sources is the necessary tool enabling a monitoring programme. The register is a database fed with data on the use of underwater noise sources (noise events).

Tools for impulsive noise sources monitoring (i.e. tool for setting the noise register): the joint use of a spreadsheet (MS Excel or similar) and common GIS software is considered as the recommendation to meet the minimum requirements of Candidate Common Indicator 26, where the spreadsheet is used to record noise events, and the GIS software to perform spatial analysis of these areas (e.g. to compute the number of pulse-block days).

What noise sources should be registered:

Pile driving. Pile driving is a conventional technique employed in many coastal and offshore constructions, such as wind farms, offshore platforms, harbour extensions etc. The growth of the wind energy sector caused a great increase in the use of this technique both in coastal and offshore environments.

Airgun. The airgun is presently the most employed technology for carrying out marine seismic exploration. Such surveys are pervasive worldwide, in shallow and deep water as well as in coastal or offshore environments

Explosives. Underwater detonations may occur for the disposal of explosives or may be planned during maritime construction, e.g. to fragment rock prior to dredging. This is the loudest source of underwater noise and need to be treated with particular care.

Sonar. Low-, mid- and high frequency active sonars (LFAS, MFAS, HFAS) are employed during military exercises as well as during academic and industrial surveys, such as fish stock estimations and bathymetric surveys. Especially, low- and mid- frequency naval sonars are of great concern given the mass stranding events of cetaceans linked in space and time with military exercises and need to be addressed with particular care.

Acoustic Deterrents. High-powered devices designed to keep marine mammals away from fish farms by causing them pain. Frequencies range from 5-20KHz for repelling pinnipeds and 30-160KHz for delphinids (Carretta et al, 2008, Lepper et al, 2004, Lurton, 2010, OSPAR, 2009).

What information to collect to be entered into the register:

Data	Units and/or comments	Priority
Position	Geographic position (lat/long) or pre-defined block/area which can be identified through a coding system (single identifier for each block used)	Required
Dates	Start and end day	Required
Source intensity	Source level or proxy, unique levels or in bins (see Annex 5.3 for corresponding tables of values in bins)	Required
Source spectra	Frequency range	Additional
Duty cycle		Additional
Duration of transmission	Actual time/time period	Additional
Directivity		Additional

Source depth		Additional
Platform speed	For moving sources like seismic surveys	Additional

Minimum levels (Source intensity) for including a noise event in the register:

6. For low frequency sources: no **minimum level**, i.e. all sources to be registered
7. For mid-frequency sources, table hereafter:

Noise source type	Thresholds for inclusion of noise events in the register
Explosive	mTNTeq > 8 g
Airgun	SLz-p > 209 dB re 1 µPa m
Low/mid freq sonar	176 dB re 1 µPa m
Low/mid freq acoustic deterrent	176 dB re 1 µPa m
Other pulse	186 dB re 1 µPa ² m ² s

Again, **there is no need to measure on the field** and data are to be sought in institutions centralising data (Ministries, national regulatory bodies, **but also industries**, etc.).

Monitoring Protocol: Data on the use of impulsive noise sources (location, period, and intensity at least) are entered in the register on a regular basis (once, twice or more times per year). This is done by a selected contact person in each country.

Available data sources

ACCOBAMS Noise Register (<https://quietseas.ctnaval.com/>)

National data repositories available for some countries for specific activities (e.g. licensing areas for seismic exploration). Some examples:

<http://www.minetur.gob.es>

<http://www.ifremer.fr/sismer>

<http://bo.ismar.cnr.it>

<http://unmig.mise.gov.it>;

<http://unmig.sviluppoeconomico.gov.it>

<http://energy.gov.it> **Environmental Information Ministry of Energy and Infrastructure**

<http://www.sigetap.tn>

<http://www.ypeka.gr>

<http://www.beph.net>

Second Hotspots Report: updated overview of the noise hotspots in the ACCOBAMS Agreement area. ACCOBAMS-MOP8/2022/Inf43. EIGHTH MEETING OF THE PARTIES TO ACCOBAMS, Malta, 29 November – 2 December 2022. (Muller et al., 2022)

Further data repositories are open data platform developed by different organisations, where the most relevant appear to be: EMODnet (EU funded platform <https://emodnet.ec.europa.eu/en>). From EMODnet it is possible to access data gates for marine **human** activities, including marine renewable energy plants, platforms, cables, **dredging** and others.

For military activities, as a first approach, the *notice to mariners*³⁷ can be monitored to gather information on possible military activities (military areas information is also included in EMODnet). Notice to mariners are indeed freely available information for navigation.

Spatial scope guidance and selection of monitoring stations

No monitoring stations are needed, only declarative data are required to fill up the noise register. Concerning the spatial scope at large: the monitoring methodology is based on the use of a regular spatial grid to compute days with noise events per unit area, where unit area may be, for example, a cell of the regular spatial grid. If a noise event lasts several days in the same unit area), the number of days is equal to the duration (in days) of that noise event.

Temporal Scope guidance

Data on noise events can be entered in the register by the responsible institution several times in a year, for example whenever data become available.

Data analysis and assessment outputs

Statistical analysis and basis for aggregation

Basic descriptive statistics are needed to compute the indicator (Cf Indicator units, above):

1. the number of days with noise events over a time window;
2. the % of an assessment area with impulsive sound sources.

The basis for aggregation is the national Noise Register. From a regional and sub regional perspective, once the noise register is established by all countries, such data may be transferred to the ACCOBAMS Noise Register. This is proposed as the basis for regional and sub regional aggregation of data which can feed regional assessment (e.g., the MED QSR) as well as supporting countries in reporting data related to EcAp EO11.

With regards to data analysis for the assessment of the environmental status of a maritime area, the methodology applied for the initial assessment within the 2023 MED QSR needs to be considered. The indicator needs to be combined with information concerning the habitat of noise sensitive-species, in order to calculate the proportion of such habitat which is affected by impulsive noise. Using the entries in the noise register, the time steps are counted in the unit of days. In total 365 (366) evaluations are done corresponding to one assessment per day per calendar year. Notable, is that the evaluation can be limited to months, years, seasons, or sensitive times, but always based on days.

- The first step is to determine the proportion of the assessment area which is exposed to levels higher than the Level of Onset of Biological Effects (LOBE). This is done for every day of the year. This will result in an exposure map for the whole area covered by the registry.
- The next step is to determine the extent of the habitat of selected noise-sensitive species in the assessment area ($A_{Habitat}$). This can be done by applying different methods, including refined habitat modelling and/or other GIS analyses. This part should be addressed consistently with relevant indicators of EO1 (Biodiversity).
- The next step is to determine the extent of the habitat which is exposed to noise higher than LOBE (A_{LOBE}).

³⁷ Notice to mariners are information issued by country's military authorities. Such notices inform on sailing in a given area about the occurrence of some military exercise or other activity that may be dangerous for boats sailing in the area. For example, notice to mariners may be used for collecting data about military activities to be included in the noise register

- Dividing the exposed part of the habitat area, A_{LOBE} , by the total area of the habitat area, $A_{Habitat}$, results in the fraction of habitat exposed, $F_{Habitat}$. The daily fraction can be expressed as follows

$$F_{Habitat}(t_i) = \frac{A_{LOBE}(t_i)}{A_{Habitat}} \cdot 100,$$

where t_i represents each individual day i within the assessment period. The daily fraction of the habitat area per day or assessment period can vary between 0% and 100%.

This shall result in 365 (366) estimates of $F_{habitat}$. Hence, the average fraction of exposed area above LOBE during the assessment period can be determined.

Further details are provided in the thematic noise assessments and the 2023 MED QSR Pollution Assessment.

Expected assessments outputs

The assessment outputs are the following:

- Summary statistics: number of days with impulsive noise, extent of assessment area covered by noise events (in km² or %)
- GIS maps showing the spatial and temporal distribution of noise sources over a year, or calculated monthly or quarterly (exposure maps);
- Assessment statistics: % of affected habitat ($F_{habitat}$) per species considered, per assessment area (e.g., sub-division, sub-region, region).

Known gaps and uncertainties in the Mediterranean

The main uncertainties lie in the availability of declarative data (location, period and intensity of noise sources), although experience from the implementation of the MSFD in the last 15 years as well as the recent activities on IMAP-EO11 are encouraging.

Another important issue is the general perception that underwater acoustics is too complex and noise monitoring generally too expensive. However, this Candidate Common Indicator 26 was conceived to cut out most of the complexity which can be found in the science related to underwater acoustics, simplifying extremely the monitoring methodology and minimizing the costs of implementation. Therefore, an emphasis should be put on correct dissemination of the information on how this indicator is built.

By building on the achievements up to 2023, during the preparation of the 2023 MED QSR, several knowledge gaps were identified in the monitoring and assessment of Candidate Common Indicators 26 and 27, which need to be addressed following the recommendations of the 2023 MED POL Focal Points Meeting. Improving underwater noise data quality and availability is essential in addressing existing knowledge gaps. In this regard, the following specific actions should be undertaken by the Parties:

- A contribution should be provided to the ACCOBAMS regional register for impulsive noise sources, especially by sharing national data, along with the development of a cooperation mechanism to identify the source of long-distance underwater noise in order to address its long-distance effects;
- Reporting noise generating military activities is needed to provide an actual and precise assessment reflecting the real situation;
- An alternative approach needs to be tested by applying specific assessments for species and their habitats. For such an exercise, Important Marine Mammal Areas (IMMA) could be used as defined habitats.

Contacts and Version Date

Key contacts within ACCOBAMS and UN Environment/MAP for further information

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Version No	Date	Author
V.1	10/07/2016	ACCOBAMS
V.2	25/01/2019	ACCOBAMS in consultations with UN Environment/MAP
Final Version	31/05/2019	Acknowledged by the Meeting of MED POL FPs
V.4	28/05/2025	Joint CorMon Pollution and ML Meeting
V.5	19/06/2025	Approved by the Meeting of MED POL FPs
Final Version		Approved by the 12 th Meeting of EcAp Coordination Group

16. The revision of IMAP **Candidate Common Indicator 27 (EO11)**: “Levels of continuous low frequency sound with the use of models as appropriate” is presented in the table bellow.

Indicator Title	Candidate Common Indicator 27. Levels of continuous low frequency sound with the use of models as appropriate	
Relevant GES definition³⁸	Related Operational Objective	Proposed Target(s)³⁹
Noise from human activities causes no significant impact on marine and coastal ecosystems	Energy inputs into the marine environment, especially noise from human activities, are minimized	State: The extent (%) of the assessment area which is above levels causing disturbance to sensitive marine animal is below limits, or such limits are exceeded for a limited amount of time.
Rationale		
Justification for indicator selector		
Anthropogenic energy introduced by human activities into the marine environment includes sound, light and other electromagnetic fields, heat and radioactive energy. The most widespread and pervasive is underwater sound (Dekeling et al., 2014). Sound energy input can occur at varying spatial and temporal scales.		

³⁸ Following the decisions to be made at the present meeting regarding the GES definition and minor adjustments to the Targets, as outlined in working document UNEP/MED WG.626/3/Rev.1, the revised Targets and GES definition will be incorporated into the revised IMAP Pollution Indicators Factsheets.

³⁹ ibidem

Indicator Title	Candidate Common Indicator 27. Levels of continuous low frequency sound with the use of models as appropriate
Anthropogenic sounds may be of short duration (i.e. impulsive) or be long lasting (i.e. continuous). Lower frequency sounds can be transmitted far (tens to thousands of kilometres), whereas higher frequency sounds transmit less well in the marine environment (hundreds of meters to few kilometres (Urlick, 1996). Most common sources of marine noise pollution in the Mediterranean Sea include underwater explosions, geophysical surveys with the use of air guns, sonar or acoustic deterrents, pile driving, scientific research involving the use of active acoustic sources, and offshore and inshore industrial construction works (ACCOBAMS, 2016;ACCOBAMS, 2022). Marine organisms can be adversely affected both on short and long timescales (and include acute or chronic impact and temporary or permanent effects (Richardson et al, 1995). Adverse effects can be subtle (e.g. temporary reduction in hearing sensitivity, stress effects causing reduced immunity, reproduction success or survival), or more obvious (e.g. injury, death). The former may be difficult to observe and evaluate while the latter may in some circumstances be related to acute short-range noise exposures This indicator addresses the continuous low-frequency sound produced by marine activities. The major contributor to this type of ambient ocean noise is produced by maritime traffic (Hildebrand, 2009; Hildebrand & Jesus, 2021; Jalkanen et al., 2022). For this reason, it has been pointed as an important factor potentially inducing degradation of the acoustic habitat of marine animals, and particularly cetaceans which are known to communicate over very long ranges through acoustic signals. Many studies also showed negative effects on fish. The degradation of the acoustic habitat may result in masking of the biological signals, displacement, reduced fitness and other effects that may have indirect impacts on populations, such as reduced reproduction, reduced foraging success, and hence a long term degradation of the survival rate of populations (Aguilar de Soto et al., 2006; Benhemma-Le Gall et al., 2021; Blair et al., 2016; Erbe et al., 2019; Pirota et al., 2012; Putland et al., 2017; Tennessen & Parks, 2015; Williams et al., 2014; Wysocki et al., 2006).	
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Policy Context and Targets	
Policy context description	
Shipping activities are regulated by the International Maritime Organization (IMO), the United Nations agency with responsibility for many aspects of shipping, including safety, maritime security, environmental concerns, legal and technical matters and efficiency. IMO is the source of several legal instruments, and among these the MARPOL Convention was signed with the aim of minimising pollution in oceans and seas. MARPOL includes 6 Annexes, each one addressing a category of pollution produced by ships: oil emissions, noxious liquids, packaged harmful substances, sewage, garbage, air pollution. Unfortunately, MARPOL defines pollution as substance, not energy, contrary to many other regulation bodies including other UN-related bodies such as the UN Convention on the Law of the Sea (UNCLOS). Underwater noise is therefore not addressed by MARPOL. However, in recent years the Marine Environment Protection Committee (MEPC) of the IMO addressed underwater noise produced by shipping. As a result, guidelines on the reduction of noise emission from ships were first issued in 2014, and then revised in 2023 (IMO, 2023). However, it is worth noting that such guidelines address noise radiated from single ships and the way to mitigate the emissions, while the general rising in ambient ocean noise due to increased shipping (i.e. an ecosystem approach) is not specifically addressed. The MSFD and EcAp processes are the first legal instruments for monitoring, assessing and setting targets, at least for their competence areas (the European Union and the Mediterranean region, respectively). All the policy documents developed in the framework of such initiatives are therefore a novelty concerning the regulation of emissions of pollutants related to shipping. A closer cooperation with such global regulatory bodies as the IMO and MARPOL is certainly a major asset for the success of initiatives aimed at reducing ship radiated noise and the associated impacts, thus delivering good environmental status. Beyond large scale regulation, many interesting initiatives are being proposed to strengthen the implementation of mitigation measures applied to shipping at a local scale. For example, some ports authorities are setting specific rules to foster ships complying with increasingly high environmental standards, including low noise emissions through reduced speed or displacement of ship lanes. One of the most known initiatives appears to be the port authority of Vancouver. Of course, the sum and synergy of increasing numbers of local initiatives has the potential to create a network big enough to produce positive effects at the ecosystem scale.	
Targets	

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The target is defined through a threshold system that combines data on shipping noise and information about the habitat of noise-sensitive species. This way, it is possible to move towards the assessment of whether the risk of the negative impacts occurring on populations of such species is acceptable. This threshold system set is based on the continuous noise assessment methodology outlined in the 2023 MED QSR which was accepted by the Contracting Parties of the Barcelona Convention (the Meeting of Integrated Ecosystem Approach Correspondence Groups, 27-28 June 2023, Athens, Greece). The methodology applied for cCI27 assessment within the 2023 MED QSR is in turn based on previous activities carried out by ACCOBAMS and UNEP/MAP-SPA/RAC under the QUIETMED and QUIETSEAS projects (Azzellino et al., 2023; Maglio et al., 2021; Maglio, Frey, et al., 2018) as well as by the European Commission technical group on underwater noise (Borsani et al., 2023). A single threshold is defined and it applies to the % of habitat of noise-sensitive species affected by continuous noise. Based on that, to achieve or maintain the Good Environmental Status, the following thresholds should be observed by the Contracting Parties: 1. No more than 20% of the habitat of selected species should experience noise levels above the Level of Onset of Biological Effects (LOBE) exceeding in any given month (based on the average noise level for that month) during the assessment year. The threshold values are expressed as a range (X% or lower) in order to take regional and sub-regional specificities into account. Assessors select a specific threshold value within this range based on the assessment's context and purpose.. While the threshold is determined using available data, it may be adjusted as new scientific knowledge emerges.	
Policy documents ACCOBAMS Resolution 7.13 - Anthropogenic Noise. ACCOBAMS-MOP7/2019/Doc38/Annex15/Res.7.13. 2019 ACCOBAMS Resolution 8.17 - Anthropogenic Noise. ACCOBAMS-MOP7/2019/Doc38/Annex15/Res.7.13. 2023 Commission Decision 2017/848/EU of 17 May 2017 laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardised methods for monitoring and assessment, and repealing Decision (2010/477/EU) Decision IG.21/3 (COP18,2013) on Ecosystems Approach including adopting definitions of Good Environmental Status (GES) and Targets (UNEP(DEPI)/MED IG.21/9). Decision IG.22/7 (COP19, 2016) on Integrated Monitoring and Assessment Programme (IMAP) of the Mediterranean Sea and Coast and Related Assessment Criteria (UNEP(DEPI)/MED IG.22/28). Decision IG.25/1 (COP22, 2021) on UNEP/MAP Medium-Term Strategy 2022-2027. Decision IG.22/7 (COP19, 2016) on the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria. Decision IG.23/6 (COP20, 2017) on 2017 Mediterranean Quality Status Report. Decision IG.24/4 (COP21, 2019) on Assessment Studies. Decision 26/3 (COP23, 2023) on the 2023 Mediterranean Quality Status Report and a Renewed Ecosystem Approach Policy in the Mediterranean.	

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Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 (MARPOL 73/78). IMO (2023). Revised Guidelines for the reduction of underwater radiated noise from shipping to address adverse impacts on marine life.	
Indicator analysis methods	
Indicator Definition	
The main indicator is the average sound pressure level (SPL) in selected frequency bands (third-octave bands centred at 20, 63, 125, 250, 500, 2000), on a monthly basis, where: SPL means Sound Pressure Level in dB (re 1µPa) Additionally, the 33%-Exceedance Level may be calculated on an annual basis. The term “Exceedance Level” is defined by the international standard ISO 1996-1:2003(E) as the level exceeded during 33% of the analysed time window Average SPL gives an overview of average noise conditions in the assessed time window (1 year); while the 33% Exceedance Level provides a view of the highest noise levels for about one third of a year, corresponding to roughly 4 months. The use of 33% Exceedance Level is based on the assumption that in the Mediterranean Sea marine traffic noise increases substantially in the Summer season (June to September) mainly due to leisure craft, but also to increased numbers of navigating ships due to better weather conditions. The 33% Exceedance level is thought to detect such phenomenon, as an additional indicator for GES assessment. Concerning frequencies, they were chosen as follows: 20Hz, based on fin whale biological significance. 20 Hz is indeed the peak frequency of the vocalizations of fin whales and monitoring the 1/3 octave band centred at this frequency may help assessing the masking effect from anthropogenic noise sources: • 63 Hz, based on the frequency bands where noise from shipping is most likely to dominate over other sources (consistent with MSFD ambient noise criterion) • 125 Hz, based on frequency bands where noise from shipping is most likely to dominate over other sources (consistent with MSFD ambient noise criterion) • 250 Hz, based on frequency bands where noise from shipping is most likely to dominate over other sources according to Mediterranean data (e.g. Pulvirenti et al. 2014) • 500 Hz, based on frequency bands where noise from shipping is most likely to dominate over other sources according to Mediterranean data (e.g. Pulvirenti et al. 2014) • 2000 Hz, based sperm whale biological significance. Although sperm whale click peak frequency has been identified in 5000 Hz (Madsen et al., 2002; Watkins et al. 1980), its lower peak frequency limit has been defined in 2000 Hz. It seems more relevant to use the lower peak frequency limit because it is more likely to be affected by anthropogenic noise and it requires lower sampling rates to be recorded, reducing the cost of monitoring equipment and data archiving volume.	

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Methodology for indicator calculation The calculation of the indicator requires to perform the following tasks: - Analysing recordings from deployed acoustic equipment and computing graphs of sound levels against time, sound levels against frequency, or similar; - Modelling the propagation of noise from continuous sources (ships) for estimating levels at large scales and for mapping the indicators in the assessment areas. The metrics to employ are the following: - Average Sound Pressure Level (central tendency) calculated monthly, either from recordings obtained from the field or based on a modelling process; - Additionally, 33%-Exceedance level over a year may be used, meaning the level corresponding to the 67th percentile of the distribution of SPL values. This indicator appears as useful especially in case of analysis of recordings from long-term monitoring stations (1 year data) to highlight the effect of leisure craft. When processing audio files obtained in the field, the samples to be used for statistical analysis are short cuts of sound recordings of fixed duration, where the number and duration of each sample may vary. As a general rule, samples of maximum 1 minute should be used. For models, different approaches exist to obtain the required statistics: temporal approaches and probabilistic approaches. Regardless of the approach used for models, it is recommended to consider available guidance on the use of the models (see here-below the section “List of Guidance documents and protocols available”). Further details are also provided in the thematic noise assessments and the 2023 MED QSR Pollution Assessment.	
Indicator units Sound Pressure Levels expressed in dB re 1µPa	
List of Guidance documents and protocols available A basin-wide strategy for underwater noise monitoring in the Mediterranean. Report prepared by Alessio Maglio, Manuel Castellote and Gianni Pavan. (ACCOBAMS, 2015) Best practice guidelines on acoustic modelling and mapping. 2017/848/EU and ACCOBAMS premises, and generalisation for the EcAp process. Deliverable 3.3, QUIETMED project. DG ENV/MSFD Second Cycle/2016. (Taroudakis et al., 2018) Best practices guidelines on signal processing algorithms for the preprocessing of the data and for obtaining the noise indicator. Deliverable 3.2, QUIETMED project. DG ENV/MSFD Second Cycle/2016. (Vukadin et al, 2018) Dekeling, R.P.A., Tasker, M.L., Van der Graaf, A.J., Ainslie, M.A, Andersson, M.H., André, M., Borsani, J.F., Brensing, K., Castellote, M., Cronin, D., Dalen, J., Folegot, T., Leaper, R., Pajala, J., Redman, P., Robinson, S.P., Sigraay, P., Sutton, G., Thomsen, F., Werner, S., Wittekind, D., Young, J.V., 2014. Monitoring Guidance for Underwater Noise in European Seas, Part I: Executive Summary, JRC Scientific and Policy Report EUR 26557 EN, Publications Office of the European Union, Luxembourg, 2014, doi: 10.2788/29293.	

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End Report on GES criteria assessment at basin scale with focus on the consistency and coherence of approaches at national levels (including operational targets definition) - Deliverable 2.3. No. 11.0661/2016/748066/SUB/ENV.C2. (Maglio et al, 2018) Impacts of noise and use of propagation models to predict the recipient side of noise. Report prepared under contract ENV.D.2/FRA/2012/0025 for the European Commission. Centre for Environment, Fisheries & Aquaculture Science, UK. , (July), p.27. Available at: http://mcc.jrc.ec.europa.eu/document.py?code=201601081529 (Borsani et al, 2015) Proposal of a methodology to establish thresholds values for D11C2 in the Mediterranean and Black Sea regions. QUIETSEAS D5.2. (Azzellino et al, 2023) QUIETSEAS Deliverable 9.1. Guidelines for Competent Authorities on a reporting method for continuous noise appropriate for the GES assessment and the establishment of thresholds. Review of underwater acoustic propagation models, p.35. (Wang et al, 2014) Review of risk-based approaches and frameworks for D11C2. QUIETDSEAS D3.1. (Maglio et al, 2021).	
Data Confidence and uncertainties Many sources of uncertainty exist concerning both measurements and models: the characteristics of the sound recorder used, the calibration, the mooring conditions and on the location of deployment (near or far from shipping lanes, in shadow areas, etc.), as well as many steps and settings of the data processing. Also, modelling methods contemplate a large number of variability factors often hindering meaningful comparisons among different monitoring programs. Such uncertainty results in well-known shortcomings in the understanding of how anthropogenic noise may affect the environment. However, despite these sources of uncertainty, many steps forward have been done since the beginning of the implementation of the EcAp process, and considerable effort was done to develop guidance and best practices. Many of these efforts were focussed in northern European waters and the North Atlantic, but recent projects (QUIETMED, QUIETMED2 and QUIETSEAS) produced valuable work in the direction of laying down common methods and shared understanding of the several technical aspects.	
Methodology for monitoring, temporal and spatial scope	
Available Methodologies for Monitoring and Monitoring Protocols General monitoring methodology: the combined use of measurements and modelling is recommended. Notable is that models are necessary to carry out GES assessment. Continuous sound recording should be done at fixed sites through sound recording stations. Acoustic modelling and mapping through appropriate analytical procedures producing estimations to be validated from field measures. The use of in-situ acoustic measurements is essential for: • Gathering fundamental field data to establish information on the ambient noise in a given location • Reducing uncertainty on source levels to be used as the input for modelling; • Increasing evidence base to improve management decisions. The use of models is essential for: •	

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- Reducing the number of stations required to establish a trend over a fixed amount of time (similar reasoning to above), therefore reducing the cost of monitoring; - Helping with the choice of monitoring positions and equipment (selecting locations where the shipping noise is dominant as opposed to explosions or seismic surveys being dominant); - Producing noise maps, which are a valuable tool to quickly understand the ensonification levels over large areas, and the necessary tool to calculate the extent of impacted areas - Predicting future scenarios and therefore testing different noise reduction strategies, e.g. by answering simple questions such as what happens if we reduce by XX dB the noise of 1% (or 20% etc.) of the circulating ships?	
<u>Monitoring Protocol</u>: recordings are stored in a storage facility (server) during the year. These can be retrieved manually or automatically transmitted through appropriate networks (wi-fi, GPRS, Satellite) from the station to the server. Cabled sound recorders, directly connected to land, can also be used. Fieldwork is limited to deployment and maintenance of sound recorders. Data can be analysed once a year over the whole acoustic dataset obtained or periodically during the year. Models and mapping are computed through appropriate software once a year or with other suitable periodicity. Contracting Parties within a subregion are recommended to work together to establish an ambient noise monitoring system. When defining such monitoring system, a number of aspects should be addressed (not exhaustive list): measuring equipment quality, calibration, deployment depth, mooring configuration.	
Available data sources Since 2020, the NETCCOBAMS platform provide maps of underwater continuous noise (based on shipping noise) in the whole ACCOBAMS Area (Mediterranean Sea, Black Sea, Atlantic area contiguous to the Mediterranean Sea). It is expected that the European platform EMODnet shall include in the next future a section dedicated to underwater noise data made available from monitoring stations placed in waters surrounding the EU (thus with some good coverage of the Mediterranean Sea). Input environmental data for acoustic modelling (depth, seafloor, temperature and salinity profiles, etc.) are available at many freely available data repositories (EMODnet, Copernicus, NOAA, etc.). Input ship data (AIS databases) for acoustic modelling (ship positions, speed, vessel type, etc.) can be accessed through common AIS networks and/or suppliers.	
Spatial scope guidance and selection of monitoring stations <u>Spatial scope</u>: Contracting Parties should consider the whole maritime space under their jurisdiction for locating the acoustic devices, following the guidelines hereafter for selecting the location. Further, noise mapping based on sound propagation modelling provides an effective way of covering the whole maritime space of a country with limited costs. <u>Location of sampling sites</u>: - Monitoring in both high traffic and low traffic areas, also searching and including spots where the noise is supposed to be the lowest; - Monitoring may be more cost effective if existing oceanographic stations included noise monitoring along with the other oceanographic variables already being monitored, such as European Multidisciplinary Seafloor Observation (EMSO) - European Seas Observatory Network of Excellence (ESONET-NoE);	

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- Consider local topography and bathymetry effects e.g. where there are pronounced coastal landscapes or islands/archipelagos it may be appropriate to place hydrophones on both sides of the feature; - As far as possible avoid locations close to other sound producing sources that might interfere with measurements e.g. oil and gas exploration or offshore construction activities. Areas of particularly high tidal currents may also affect the quality of the measurement; - Monitoring station should be primarily located in important cetacean habitat, as identified by ACCOBAMS (Resolution 4.15); - Whenever possible use deep monitoring stations, either autonomous or cabled, to limit the influence of surface and sub-surface noise.	
Temporal Scope guidance	
Monitoring stations should be able to continuously record underwater sound. The temporal scheme for the monitoring may vary according to the type of equipment and the logistics for recovering and/or retrieving data. It is desirable that the deployments cover all the year, but there is no recommended retrieval periodicity with regards to moored equipment.	
With regards to modelled noise data, as the defined Target is to assess the % of habitat affected by continuous noise on a monthly basis, noise maps should be produced at least for 1 month and ideally for all months.	
Data analysis and assessment outputs	
Statistical analysis and basis for aggregation	
Appropriate analysis software (usually algorithms developed in some programming language such as Matlab and others) is used to derive average SPL (and 33%-Exceedance Levels). Considering the methodology applied for cCI 27 within the 2023 in MED QSR, any statistics reflecting the central tendency of the monthly scenario can be chosen (e.g., the median, the arithmetic mean, or other metric reflecting the central tendency).	
For the processing of acoustic data, a sample of short cuts (segments) of sound recording (the samples for calculation of statistics) should be used to compute the noise metrics. As a general rule, the duration of single segments should not exceed 1 minute, unless otherwise decided and justified.	
Finally, aggregation could be done through transboundary cooperation at the sub-regional level. The tool NETCCOBAMS is now being implemented by ACCOBAMS with this purpose for continuous noise. The NETCCOBAMS platform can host data about underwater noise levels in HDF5 format, as outlined in the Continuous Noise Data Call (issued in 2022 in the framework of the QUIETSEAS project)	
With regards to data analysis for the assessment of the environmental status of a maritime area, the indicator need to be combined with information concerning the habitat of noise sensitive-species, in order to calculate the proportion of such habitat which is affected by impulsive noise.	
By using models, it is possible to obtain noise maps providing an estimate of average noise levels over the areas assessed. The temporal resolution of the assessment (Temporal Assessment Window, TAW) is monthly:	
- The first step is to determine the parts of the assessment area which are exposed to levels higher than the Level of Onset of Biological Effects (LOBE). This is done for every month of the year. This will result in an exposure map for the whole area which is assessed. - The next step is to determine the extent of the habitat of selected noise-sensitive species in the assessment area ($A_{Habitat}$). This can be done with different methods, including refined	

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habitat modelling and/or other GIS analyses. This part should be addressed consistently with relevant indicators under EO1 (Biodiversity). - The next step is to determine the extent of the habitat which is exposed to noise higher than LOBE (A_{LOBE}). - Dividing the exposed part of the habitat area (A_{LOBE}) by the total habitat area ($A_{Habitat}$) results in the fraction of habitat exposed, $F_{Habitat}$, which is expressed as: $F_{Habitat}(t_i) = \frac{A_{LOBE}(t_i)}{A_{Habitat}} \cdot 100\%,$ where t_i represents an individual month i within the assessment period (1 year). The daily fraction of the habitat area per month can vary between 0% and 100%.	
Expected assessments outputs The assessment outputs are the following: - Levels of mean sound pressure level over a suitable temporal windows (month, season, year); - Levels of 33% exceedance level over a year; - Noise maps, i.e. maps showing the distribution of estimated noise levels across the assessed area. - Noise exposure maps, i.e., maps showing the areas where the LOBE level is exceeded. - Assessment statistics: % of affected habitat ($F_{habitat}$) per species considered, per assessment area (e.g., sub-division, sub-region, region), calculated on a monthly basis.	
Known gaps and uncertainties in the Mediterranean The Mediterranean present a majority of deep-water environment whose soundscape has been poorly studied, although some fixed deep monitoring observatories (2 stations of the EMSO/ESONET network, 1 in the NW Mediterranean, 1 in the Ionian Sea) provide long term acoustic data since many years. Obviously, many other temporary deployments from the '90s to date were done and data are available for reviewing levels, results, and more with a view of establishing baselines. However, common shortcomings (lack of standards for calibration, and the many source of variability highlighted above in this factsheet), may prevent from extracting meaningful information from such review concerning the Common Indicator 27. Further, the poor AIS coverage in some parts of the Mediterranean, especially the southern part, may affect the quality of monitoring through modelling techniques. However, the work done in the last 10 years on underwater noise from an ecosystem perspective enabled a better understanding, and thus a better management and mitigation, of the different sources of uncertainties. By building on the achievements up to 2023, during the preparation of the 2023 MED QSR, several knowledge gaps were identified in the monitoring and assessment of Candidate Common Indicators 26 and 27, which need to be addressed following the recommendations of the 2023 MED POL Focal Points Meeting. Improving underwater noise data quality and availability is essential in addressing existing knowledge gaps, as outlined in the Guidance Factsheet for IMAP Ccandidate Common Indicator 26.	
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Version No	Date	Author
V.1	10/07/2016	ACCOBAMS
V.2	25/01/2019	ACCOBAMS in consultations with UN Environment/MAP
Final Version	31/05/2019	Acknowledged by the Meeting of MED POL FPs
V.3	28/05/2025	Joint CorMon Pollution and ML Meeting
V.4	19 June 2025	Approved by the Meeting of MED POL FPs
Final version		Approved by the 12 th Meeting of EcAp Coordination Group