UNITED NATIONS

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UNEP/MED WG.620/Inf.6/Rev.1

Mediterranean Action Plan
Barcelona Convention

15 September 2025
Original: English

Meeting of the MAP Focal Points

Athens, Greece, 16-19 September 2025

Agenda Items 3 and 4: Progress Report on Activities Carried Out during the 2024-2025 Biennium and Financial Implementation Report for 2022-2023 and 2024-2025

Agenda Item 5: Specific Matters for Consideration and Action by the Meeting, including Draft Decisions

Reports of the 11th and 12th Meetings of the Ecosystem Approach Coordination Group (Videoconference, 2 October 2024; Athens, Greece, 15 September 2025, respectively)

UNEP/MAP
Athens, 2025

UNITED NATIONS

EP

UNEP/MED WG.595/7

Mediterranean Action Plan
Barcelona Convention

23 October 2024
Original: English

11th Meeting of the Ecosystem Approach Coordination Group

Videoconference, 2 October 2024

Report of the Meeting

UNEP/MAP
Athens, 2024

Table of Contents

Introduction

1. In accordance with the UNEP/MAP Programme of Work 2024-2025 (Decision IG.26/14) and Decision IG.26/3 "The 2023 Mediterranean Quality Status Report and a Renewed Ecosystem Approach Policy in the Mediterranean", adopted by the 23rd Ordinary Meeting of the Contracting Parties to the Barcelona Convention and its Protocols (COP 23), Portorož, Slovenia, 5-8 December 2023, the UNEP/MAP – Barcelona Convention Secretariat organized the 11th Meeting of the Ecosystem Approach Coordination Group (EcAp CG), online on 2 October 2024.

Participation

2. The following Contracting Parties to the Barcelona Convention were represented at the Meeting: Albania, Bosnia and Herzegovina, Croatia, Cyprus, European Union, Egypt, France, Greece, Italy, Libya, Malta, Montenegro, Morocco, Slovenia, Spain, Tunisia, and Türkiye.

3. UNEP/MAP – Barcelona Convention Secretariat was represented, by its Coordinating Unit, the Mediterranean Pollution Assessment and Control Programme (MED POL), the Regional Activity Centre for Information and Communication (INFO/RAC), the Priority Actions Programme Regional Activity Centre (PAP/RAC), the Plan Bleu Regional Activity Centre (Plan Bleu/RAC), the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC), and the Specially Protected Areas Regional Activity Centre (SPA/RAC).

4. The following Specialized Agency of the United Nations also participated to the Meeting: General Fisheries Commission for the Mediterranean (GFCM).

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

Agenda Item 1: Opening of the Meeting

6. The Meeting was opened at 10:00 on Wednesday, 2 October 2024 by Ms Tatjana Hema, Coordinator, UNEP/MAP – Barcelona Convention Secretariat and she welcomed the participants. In her opening statement she recalled the main issues that the meeting was expected to discuss and review and highlighted its importance in delivering mandates included in Decision IG.26/3 of COP 23. In particular, she mentioned that this meeting would: (a) review and endorse the Summary for Policy Makers of the 2023 Mediterranean Quality State Report (MED QSR); (b) review and provide guidance to the Secretariat regarding the process for revising Ecosystem Approach (EcAp) Policy and Integrated Monitoring and Assessment Programme (IMAP) for the Mediterranean; as well as (c) review the "Terms of Reference for CORMONs, CORESA and Online Working Groups and Flow of Interactions between Ecosystem Approach and MAP Governing Bodies", for their potential inclusion into the to the new EcAp Decision. Ms Hema, made reference to a number of important processes that are ongoing and are coordinated by the Secretariat, including the revision of the Mediterranean Strategy for Sustainable Development (MSSD) and the Climate Change Adaptation Strategy. She stressed the important role of the Regional Seas' on aspects pertinent to ocean governance and integrated management of the marine and coastal environment, as highlighted by the recent United Nations Environment Assembly (UNEA) resolution 6/15. Strengthening ocean efforts to tackle climate change, marine biodiversity loss and pollution

7. The representative of Slovenia, on behalf of the President of the Bureau, also made brief welcoming remarks, highlighting the important work of the Ecosystem Approach Coordination Group, as well as the paramount importance EcAp on Marine Spatial Planning (MSP), Integrated Coastal Zone Management (ICZM), coast resilience and source-to-sea approach.

Agenda Item 2: Organizational Matters

UNEP/MED WG.595/1; UNEP/MED WG.595/2; UNEP/MED WG.595/Inf.1/Rev.1

2.1. Rules of Procedure for the Meeting of the Ecosystem Approach Coordination Group

8. The Meeting agreed that the Rules of procedure for meetings and conferences of the Contracting Parties to the Convention for the Protection of the Environment and the Coastal Region of the Mediterranean and its Protocols (UNEP/IG.43/6, Annex XI) would apply *mutatis mutandis* to their deliberations.

2.2. Election of Officers

9. In accordance with rule 20 of the Rules of procedure for meetings and conferences of the Contracting Parties, the Meeting elected its officers, as follows:

- President: Ms Audrey Prat, France
- Vice-President: Mr Tilen Obradović, Slovenia
- Vice-President: Mr Mohamad Said, Egypt
- Vice-President: Mr Konstantinos Antoniadis, Cyprus
- Rapporteur: Ms Senida Dzajic-Rghei, Bosnia and Herzegovina

2.3. Adoption of the Provisional Agenda

10. The QSR Programme Management Officer presented the Annotated Agenda and timetable. The Meeting adopted its agenda on the basis of the Provisional Agenda and Provisional Annotated Agenda, including the proposed timetable, circulated in documents UNEP/MED WG.595/1 and UNEP/MED WG.595/2, respectively.

11. The agenda is attached as Annex II to the present report.

2.4. *Organization of Work*

12. The discussions were held in line with the Meeting agenda, in plenary sessions. Simultaneous interpretation in English and French was provided during the Meeting.

Agenda Item 3: Summary for Policy Makers of the 2023 Mediterranean Quality Status Report

UNEP/MED WG.595/3

13. UNEP/MAP Coordinator presented the mandate pertinent to the preparation of the Summary for Policy Makers of the 2023 Mediterranean Quality Status Report as provided for in Decision IG.23/6 of COP 23, including the approach followed for the establishment of the respective Working Group (WG) consisting of Countries’ experts its synthesis and *modus operandi*.

14. UNEP/MAP Coordinator made reference to the unanimous agreement of the WG Countries’ Experts to prepare the Summary for Policy Makers (SfPM) of the 2023 Mediterranean Quality Status Report, in line with the following agreed requirements:

a) The length of the SfPM to be of maximum 20-25 pages, including graphs/figures/tables, with harmonious and balanced representation of the various Ecological Objectives (EOs) / Common Indicators (CIs);

b) The text of the SfPM to be based explicitly on the text of the Executive Summary (ES) (Decision IG.23/6 – Annex I);
c) The maps/graphs/visuals to be selected from the web-version/website of the 2023 MED QSR.

15. Mr Francois Galgani, UNEP/MAP Expert, provided some highlights including a brief presentation of the “Summary for Policy Makers of the 2023 Mediterranean Quality Status Report” (UNEP/MED WG.595/3), focusing on the main assessment findings, take-home messages and recommendations.

16. Some Members of the EcAp Coordination Group asked for clarifications on specific sections of the Summary for Policy Makers of the 2023 Mediterranean Quality Status Report, having a primary focus on aspects relevant to pollution (i.e., Ecological Objectives 5 and 9), and provided the Secretariat with specific text proposals, which were edited and incorporated into the text during the Meeting.

17. One member of the EcAp Coordination Group commented on the need to revise Figure 6 of the SfPM, to delete references to Marmara Sea, being outside the geographical scope of the Barcelona Convention. The Secretariat apologized and requested INFO/RAC to redesign the aforementioned map.

18. One member of the EcAp Coordination Group requested the Secretariat to distribute to meeting participants the written comments sent on Working Document UNEP/MED WG.595/3. In response, the Secretariat distributed the comments to all meeting participants on 4 October 2024.

19. The Meeting endorsed the Summary for Policy Makers of the 2023 MED QSR, after incorporating a number of editorial proposals received during the Meeting. The final version has been attached to the Conclusions and Recommendations of the Meeting.

Agenda Item 4: Ecosystem Approach Policy in the Mediterranean: Main Directions, Elements and Timeline

UNEP/MED WG.595/4; UNEP/MED WG.595/6; UNEP/MED WG.595/Inf.3

20. UNEP/MAP Coordinator presented the preliminary proposal for revising the EcAp Policy for the Mediterranean, including the respective rational and approach, as reflected in Working Document UNEP/MED WG.595/4 “Revised Ecosystem Approach Roadmap: Main elements, Process and Timetable” and Information Document UNEP/MED WG.595/Inf.3 “Revised Ecosystem Approach Policy for the Mediterranean”. She also stressed the importance of linking to this process the “Terms of Reference for CORMONs, CORESA and Online Working Groups and Flow of Interaction between Ecosystem Approach and MAP governing bodies” as reflected in Working Document UNEP/MED WG.595/6.

21. The Meeting acknowledged the substantive progress achieved in the implementation of Ecosystem Approach (EcAp) in the Mediterranean, and welcomed the preliminary elements proposed by the Secretariat for revising EcAp.

22. The Secretariat requested for specific feedback on a number of aspects, as reflected in the Conclusions and Recommendations of the Meeting, and provided hereunder:

a) Whether the EcAp policy should continue being based on the stepped approach;
b) The proposal for updating the EcAp Vision in line with the one adopted in the framework of UNEP/MAP Mid-Term Strategy (MTS) 2022-2027;
c) The proposal for updating the Strategic Goals for EcAp;
d) The approach proposed for building Step IV on operational objectives, indicators, Good Environmental Stats (GES) definitions and targets, as presented in Annex I of Information

Document WG.595/Inf.3;

e) The proposal for updating EcAp overall timeline and its major delivery milestones;
f) The approach proposed for building Step VI (Programme of Measures) regarding the listing of existing measures as an annex or preparing some overall generic paragraphs in the main body for this Step, or a combination of both; and
g) The inclusion of the MAP Governance Structure for EcAp implementation as an integral part of the EcAp Policy.

23. The Meeting requested for additional time in order for the Contracting Parties Representatives to consult internally and provide relevant feedback and requested the Secretariat to circulate the aforementioned elements through e-mail correspondence with a timeline till mid-November 2024. The relevant e-mail communication was distributed by the Secretariat on 17 October 2024, with a deadline by 20 November 2024.

Agenda Item 5: Enhancing the Implementation of the Integrated Monitoring and Assessment Programme for the Mediterranean Sea and Coast

UNEP/MED WG.595/5; UNEP/MED WG.595/Inf.4

24. The QSR Programme Management Officer, Mr Christos Ioakeimidis, presented the preliminary proposal and respective element for revising the Integrated Monitoring and Assessment Programme for the Mediterranean Sea and Coast (IMAP), as reflected in Working Document UNEP/MED WG.595/5 “Revised Integrated Monitoring and Assessment Programme: Main elements and Outline” and Information Document UNEP/MED WG.595/Inf.4 “Revised Integrated Monitoring and Assessment Programme for the Mediterranean Sea and Coast and Related Assessment Criteria”.

25. Ms Elisabetta Betulla Morello, Fishery Resources Officer at the GFCM, presented the work undertaken by GFCM pertinent to Ecological Objective 3 (EO3) – Fisheries. She presented the framework of cooperation between GFCM and UNEP/MAP, with an emphasis on aspects pertinent to promoting ecosystem-based approaches for the conservation of marine and coastal environment and ecosystems and the sustainable use of marine living and other natural resources. Particular emphasis was given on the ongoing process for developing and drafting the Common Indicators for IMAP EO3 (Fisheries), as well as the contribution of GFCM to the preparation of the 2023 MED QSR and its chapter on commercially exploited fish.

26. The Meeting acknowledged the important progress achieved in the implementation of IMAP in the Mediterranean, and welcomed the preliminary elements proposed by the Secretariat for its revision.

27. The Secretariat requested for specific feedback on a number of aspects, as reflected in the Conclusions and Recommendations of the Meeting, and provided hereunder:

a) The preliminary proposal of the revised outline for IMAP Ecological Objectives and Common Indicators;
b) The outline of the draft decision as set out in Information Document WG.595/Inf.4; and
c) The inclusion of all relevant assessment criteria for the respective IMAP Clusters (e.g., biodiversity and non-indigenous species, pollution and marine litter, etc.), and IMAP Policy, in the draft IMAP decision.

28. The Meeting requested for additional time in order for the Contracting Parties Representatives to consult internally and provide relevant feedback and requested the Secretariat to circulate the aforementioned elements through e-mail correspondence with a timeline till mid-November 2024. It was also agreed that the aforementioned elements will be reviewed in depth by the respective CORMON Meetings, plan to be held from October 2024 until June 2025, for final consideration by the 12th EcAp Coordination Group and MAP Focal Points Meetings (September 2025), and COP 24

(December 2025). The relevant e-mail communication was distributed by the Secretariat on 17 November 2024, with a deadline by 20 November 2024.

Agenda Item 6: Any Other Business

29. No other matters were raised for discussion under this agenda item.

Agenda Item 7: Conclusions and Recommendations

UNEP/MED WG.595/1; UNEP/MED WG.595/2; UNEP/MED WG.595/3; UNEP/MED WG.595/4; UNEP/MED WG.595/5; UNEP/MED WG.595/6; UNEP/MED WG.595/7; UNEP/MED WG.595/Inf.1/Rev.1; UNEP/MED WG.595/Inf.2; UNEP/MED WG.595/Inf.3; UNEP/MED WG.595/Inf.4

30. The Meeting reviewed, commented on, and approved the Conclusions and Recommendations, prepared by the Rapporteur, attached to the present report as Annex III including its Appendix I (final version of the Summary for Policy Makers of the 2023 Mediterranean Quality Status Report).

Agenda Item 8: Closure of the Meeting

31. After expressing the usual courtesies, the Chair declared the Meeting closed at 17:30 on 02 October 2024.

Annex I

List of Participants

REPRESENTATIVES OF THE CONTRACTING PARTIES / REPRÉSENTANTS DES PARTIES CONTRACTANTES

ALBANIA / ALBANIE	**Ms Edit Vardhami** Ministry of Tourism and Environment **Ms Klodiana Marika** Director of Nature and Forests Ministry of Tourism and Environment
BOSNIA AND HERZEGOVINA / BOSNIE ET HERZEGOVIENE	**Ms Selma Cegic** Executive Director Hydro-Engineering Institute Sarajevo **Ms Senida Dzajic-Rghei** Researcher Hydro-Engineering Institute Sarajevo
CROATIA / CROATIE	**Ms Slavica Matijevic** Institute of Oceanography and Fisheries
CYPRUS / CHYPRE	**Mr Konstantinos Antoniadis** Officer of Fisheries and Marine Research Ministry of Agriculture, Rural Development and Environment **Mr Nikolas Michailidis** Officer of Fisheries and Marine Research Ministry of Agriculture, Rural Development and Environment
EGYPT / ÉGYPTE	**Mr Mohamed Said** Egyptian Environmental Affairs Agency (EEAA)
EUROPEAN UNION / UNION EUROPÉENNE	**Mr Javier Villar Burke** Directorate General for Economic and Financial Affairs European Commission
FRANCE / FRANCE	**Ms Audrey Prat** Chargée de mission "Bon État Écologique" Direction de l'eau et de la biodiversité Ministères Transition Ecologique Cohésion des Territoires
GREECE / GRÈCE	**Ms Aimilia Drouga** Ministry of Environment and Energy General Secretariat of Natural Environment and Water General Directorate of Environmental Policy Directorate of Natural Environment and Biodiversity Management
ITALY / ITALIE	**Mr Leonardo Tunesi** Head of the Unit Marine biodiversity, habitat and species Protection Italian Institute for Environmental Protection and Research (ISPRA)

MALTA / MALTE	**Ms Angela Bartolo** Senior Officer Biodiversity & Water Unit Environment and Resources Authority
MONTENEGRO / MONTENÉGRO	**Ms Milica Rudic** Head of Department for Marine and Coastal Ecosystems Ministry of Ecology, Sustainable Development and Northern Region Development
MOROCCO / MAROC	**Ms Nassira Rheyati** Ministry of Energy Transition and Sustainable Development
SLOVENIA / SLOVENIE	**Mr Tilen Obradović** Water Directorate Ministry of Natural Resources and Spatial Planning
SPAIN / ESPAGNE	**Ms Lucía Martínez García-Denche** Directorate General for the Coast and the Sea Ministry for the Ecological Transition and the Demographic Challenge **Ms Carmen Franoy**
STATE OF LIBYA / ÉTAT DE LIBYE	**Mr Salih Diryaq** Director of Sirte Branch Ministry of Environment
TUNISIA / TUNISIE	**Mr Yassine Marzougui** Agence Nationale de Protection de l'Environnement (ANPE)
TURKIYE / TURQUIE	**Mr Mehmet Tamer Çobanoglu** Ministry of Environmental Urbanization and Climate Change **Mr Ebru Olgun Eker** Ministry of Environmental Urbanization and Climate Change **Mr Sevil Öksüz** Ministry of Environmental Urbanization and Climate Change **Ms Hacer Selamoğlu Çağlayan** Ministry of Environmental Urbanization and Climate Change

UNITED NATIONS ENVIRONMENT PROGRAMME - COORDINATING UNIT AND COMPONENTS OF THE MEDITERRANEAN ACTION PLAN /
PROGRAMME DES NATIONS UNIES POUR L'ENVIRONNEMENT - UNITÉ DE COORDINATION ET COMPOSANTES DU PLAN D'ACTION POUR LA MEDITERRANÉE

UNEP/MAP COORDINATING UNIT / **PNUE/PAM UNITÉ DE COORDINATION**	**Ms Tatjana Hema** Coordinator E-mail : tatjana.hema@un.org **Mr Ilias Mavroeidis** Programme Management Officer Governance E-mail : ilias.mavroeidis@un.org **Ms Olfat Hamdan** MED POL Programme Management Officer E-mail: olfat.hamdan@un.org **Mr Christos Ioakeimidis** QSR Programme Management Officer E-mail: christos.ioakeimidis@un.org **Mr Erol Cavus** MED POL Pollution Officer E-mail: erol.cavus@un.org **Ms Patricia Busolini** Socio-Economic and Sustainable development Officer E-mail : patrizia.busolini@un.org **Mr Marc Attallah** Associate Programme Management Officer (SEMPA Project) E-mail : marc.attallah@un.org **Experts:** **Mr François Galgani** Consultant, Summary for Policy Makers 2023 MED QSR E-mail:Francois.Galgani@ifremer.fr

REGIONAL ACTIVITY CENTER FOR SPECIALLY PROTECTED AREAS (SPA/RAC) / CENTRE D'ACTIVITÉS RÉGIONALES POUR LES ZONES SPÉCIALEMENT PROTÉGÉES (SPA/RAC)	**Mr Mahmoud Elyes Hamza** Director E-mail: director@spa-rac.org **Mr Yassine Ramzi Sghaier** Projects Officer (Ecosystem Approach) E-mail: yassineramzi.sghaier@spa-rac.org **Mr Dhia Guezguez** Programme Officer (Data Management & Computing) E-mail: dhia.guezguez@spa-rac.org **Mr Anis Zarrouk** Programme Coordinator (Biodiversity) E-mail : anis.zarrouk@spa-rac.org **Mr Naziha Ben Moussa** Administrative Assistant E-mail : naziha.benmoussa@spa-rac.org **Ms Emna Derouiche** Project Technical Manager (GEF FishEBM Med Project) E-mail :emna.derouiche@spa-rac.org **Ms Lobna Ben Nakhla** Programme Officer (Species Conservation) E-mail: lobna.bennakhla@spa-rac.org **Ms Asma Kheriji** Programme Officer (Specially Protected Areas) E-mail : Asma.kheriji@spa-rac.org **Ms Aida Abdenagher** Programme Specialist (GEF FishEBM Med Project) E-mail : aida.abdennadher@spa-rac.org **Mr Atef Ouerghi** Programme Officer (Ecosystem Conservation) E-mail: atef.ouerghi@spa-rac.org **Ms Dorra Maaoui** Communications Assistant E-mail : dorra.maaoui@spa-rac.org **Mr Wassim Gaidi** Projects Technical Assistant (SEMPA & GEF CP 3.1) E-mail: wassim.gaidi@spa-rac.org

REGIONAL ACTIVITY CENTRE PLAN BLEU / PLAN BLEU CENTRE D’ACTIVITÉS RÉGIONALES	**Mr Antoine Lafitte** Director of the Observatory and relations with UNEP/MAP. E-mail : alafitte@planbleu.org **Mr Constantin Tsakas** Chief Economist E-mail: ctsakas@planbleu.org
INFORMATION AND COMMUNICATION REGIONAL ACTIVITY CENTRE (INFO/RAC) / CENTRE RÉGIONAL DES ACTIVITÉS RÉGIONAL POUR L’INFORMATION ET LA COMMUNICATION (INFO/RAC)	**Mr Arthur Pasquale** Deputy Director E-mail: arthur.pasquale@info-rac.org
PRIORITY ACTIONS PROGRAMME REGIONAL ACTIVITY CENTRE (PAP/RAC) / CENTRE D’ACTIVITÉS RÉGIONALES DU PROGRAMME D’ACTIONS PRIORITAIRES (CAR/PAP)	**Mr Marco Prem** Deputy Director E-mail: marko.prem@paprac.org **Mr Ivan Sekovski** Programme Officer E-mail: ivan.sekovski@paprac.org
THE REGIONAL MARINE POLLUTION EMERGNCY RESPONSE CENTER (REMPEC) / LE CENTRE REGIONAL MEDITERRANÉEN POUR L’INTERVENTION D’URGENCE CONTRE LA POLLUTION MARINE ACCIDENTELLE (REMPEC)	**Mr Malec Smaoui** Administrateur de Programme (OPRC) E-mail : msmaoui@rempec.org

SPECIALIZED AGENCY OF THE UNITED NATIONS PROGRAMME / AGENCE SPECIALISÉE DES NATIONS UNIES

GENERAL FISHERIES COMMISSION FOR THE FISHERIES FOR THE MEDITERRANEAN (GFCM) / COMMISSION GENERALES DES PECHES POUR LA MEDITERRANÉE (CGPM)	**Ms Elisabetta Betulla Morello** Head of the Fisheries Team E-mail: elisabetta.morello@fao.org

Annex II

Agenda of the Meeting

Agenda of the Meeting

Agenda item 1:	Opening of the Meeting
Agenda item 2:	Organizational Matters
Agenda item 3:	Summary for Policy Makers of the 2023 Mediterranean Quality Status Report
Agenda Item 4:	Ecosystem Approach Policy in the Mediterranean: Main Directions, Elements and Timeline
Agenda Item 5:	Enhancing the Implementation of the Integrated Monitoring and Assessment Programme for the Mediterranean Sea and Coast
Agenda Item 6:	Any Other Business
Agenda Item 7:	Conclusions and Recommendations
Agenda item 8:	Closure of the Meeting

Annex III

Conclusions and Recommendations

Conclusions and Recommendations of the
11th Meeting of the Ecosystem Approach Coordination Group

The 11th Meeting of the Ecosystem Approach Coordination Group (EcAp CG) was held online, on 2 October 2024. The Meeting was organized by UNEP/MAP Secretariat.

Further to its deliberations, the Meeting reviewed all agenda items as indicated in the Annotated Agenda and reached the following conclusions:

Agenda Item 3: Summary for Policy Makers of the 2023 Mediterranean Quality Status Report

1. The Meeting expressed its appreciation of the work undertaken by the Working Group (WG), consisting of Countries' experts, established under the coordination of the Secretariat (WG) for the preparation and development the Summary for Policy Makers (SfPM) of the 2023 Mediterranean Quality Status Report (MED QSR).

2. The Meeting reviewed the Summary for Policy Makers (SfPM) of the 2023 Mediterranean Quality Status Report (MED QSR), as set out in Working Document WG.595/3, made a number of revisions, took note and agreed on the request to delete references to Marmara Sea on Figure 6[1] being outside the geographical scope of the Barcelona Convention, and endorsed the Summary for Policy Makers as annexed to these conclusions.

3. The Meeting took note that the Secretariat will disseminate the changes suggested by Croatia to all Meeting participants.

Agenda Item 4: Ecosystem Approach Policy in the Mediterranean: Main Directions, Elements and Timeline

4. The Meeting reviewed and welcomed the preliminary elements proposed by the Secretariat for revising the Ecosystem Approach (EcAp) Roadmap (i.e., main elements, process and timeline), as set out in Working Document WG.595/4 and Information Document WG.595/Inf.3, but requested for more time to provide concrete comments and general guidance on:

    a) Whether EcAp policy should continue being based on the stepped approach;
    b) The proposal for updating the EcAp Vision in line with the one adopted in the framework of UNEP/MAP Mid-Term Strategy (MTS) 2022-2027;
    c) The proposal for updating the Strategic Goals for EcAp;
    d) The approach proposed for building the Step IV on operational objectives, indicators, GES definitions and targets, as presented in Annex I of Information Document WG.595/Inf.3;
    e) The proposal for an updated EcAp overall timeline and its major delivery milestones;
    f) The approach proposed for building Step VI (Programme of Measures) regarding the listing of existing measures as an annex or preparing some overall generic paragraphs in the main body for this Step, or a combination of both; and
    g) The inclusion of the MAP Governance Structure for EcAp implementation as an integral part of the EcAp Policy.

5. The Meeting requested the Secretariat to share an e-mail communication with its Contracting Parties, providing detailed information on all elements stated in paragraph 4 above, along with additional information on the process, meeting organization, and expected timelines, by 15 October 2024. The deadline for providing comments by mid-November 2024.

[1] The final version of the SfPM will not include the reference to Marmara Sea.

6. It was agreed that these proposals will be addressed and progressed during CORMON Meeting and MAP Component Focal Points Meetings, as appropriate, in line with their mandates for final submission to EcAp Coordination Group and MAP Focal Points Meetings in September 2025, and COP24 in December 2025.

Agenda Item 5: Enhancing the Implementation of the Integrated Monitoring and Assessment Programme for the Mediterranean Sea and Coast

7. The Meeting reviewed and welcomed the preliminary elements proposed by the Secretariat for revising IMAP, as set out in Working Document WG.595/5 and Information Document WG.595/Inf.4:

   a) The preliminary proposal of the revised outline for IMAP Ecological Objectives and Common Indicators;
   b) The outline of the draft decision as set out in Information Document WG.595/Inf.4; and
   c) The inclusion of all relevant assessment criteria for the respective IMAP Clusters (e.g., biodiversity and non-indigenous species, pollution and marine litter, etc.), and IMAP Policy, in the draft IMAP decision.

8. The Meeting requested the Secretariat to share an e-mail providing some concrete questions for the Contracting Parties to provide their feedback with regards to the approach proposed and overall general guidance considering that the revised IMAP will be reviewed in depth by the CORMON meetings to be held from October 2024 until June 2025 and final consideration by the EcAp Coordination Group and MAP Focal Points Meetings in September 2025, and COP 24 in December 2025.

Appendix I

Summary for Policy Makers of the 2023 Mediterranean Quality Status Report

UNITED
NATIONS

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UNEP/MED WG.595/3

UN environment programme | Mediterranean Action Plan Barcelona Convention

02 September 2024
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11th Meeting of the Ecosystem Approach Coordination Group

Videoconference, 2 October 2024

Agenda Item 3: Summary for Policy Makers of the 2023 Mediterranean Quality Status Report

Summary for Policy Makers of the 2023 Mediterranean Quality Status Report

UNEP/MAP
Athens, 2024

Note by the Secretariat

COP 23 held on 5-8 December 2023, in Portoroz, Slovenia took note of the 2023 Mediterranean Quality Status Report (2023 MED QSR) (UNEP/MED IG.26/Inf.10) and endorsed its provisional Executive Summary (Decision IG.26/3). In addition, it was requested to prepare an additional Summary for Policy Makers (SfPM) as one of the communication products of the 2023 MED QSR.

To this purpose, a dedicated Working Group, composed of six (6) Contracting Parties, namely Croatia, Egypt, France, Israel, Italy and Türkiye, was established.

The Working Group met online and decided for the SfPM of the 2023 MED QSR to be developed along the following requirements: (a) maximum length of approximately 20-25 pages; (b) the narrative text of the Executive Summary of the 2023 MED QSR (Decision IG.26/3, Annex I) to be used for the development of the text of the SfPM; and (c) graphs, pictures and visuals to be used from the web-version of the 2023 MED QSR. In addition, a number of take-home messages were prepared by the Countries' Experts of the Working Group, and therefore constitutes the only new text that has been included in the present working document (i.e., the box titled "Highlights" under page 1 of the present working document).

The proposed Summary for Policy Makers of the 2023 MED QSR is submitted to the 11th Meeting of the Ecosystem Approach Coordination Group, for its review and endorsement.

Table of Contents

Summary for Policy Makers of the 2023 Mediterranean Quality Status Report

HIGHLIGHTS[2]

Enhancing Biodiversity Protection and Management will need to improve habitat map quality and accuracy and conduct cost-efficient pressure assessments. New specific indicators, including for climate change effects, support to data collection (extended assessment coverage and long-term harmonized monitoring are key to quantify pressures), develop assessment criteria and targets, quota-based management of fisheries, and sustainable stock management. Implementation of preventive measures, strengthening legislative frameworks, control and advanced ballast water management strategies dedicated to NIS impacts will also support the protection of ecosystems.

Combating Eutrophication and Chemical Pollution will need quality data with advanced monitoring methods, including satellite imagery for eutrophication or dedicated to emergent contaminants. The promotion of sustainable practices in aquaculture, agriculture, industry, and tourism are necessary. Harmonized monitoring and reporting, based on best practices, updated environmental assessment criteria, and integrated data for risk analysis will help to better control chemical pollution.

For Marine Litter and microplastics, linking monitoring with measures targeting specific marine litter items are necessary, as well as promoting behavioral changes to reduce cigarette butts and plastic bottles through anti-smoking policies and recycling, Measures to reach GES will need to improve wastewater and sludge treatment, measures to control litter in riverine and storm water systems, and best practices for retrieving derelict fishing gear. Revision of legal frameworks, development of alternative materials and extended producer responsibility systems, will finally strengthen global policy links.

Achieving GES for Hydrography and Noise Pollution will need comprehensive digital spatial database, simplified reporting methods, integration of climate change indicators (hydrographic monitoring), consistent monitoring, data quality, management measures, and apply noise reduction technologies for maritime traffic and seismic surveys.

Management will aim at strengthening the Science-Policy Interface, promote science-based management, support integrated assessments and data validation by IMAP Info System, and consider quality assurance and quality control (QA/QC) mechanisms to ensure IMAP Info system interoperability with national and international databases.

Introduction

1. While the Mediterranean Action Plan (MAP) was initiated in 1975, leading to the Barcelona Convention in 1976 to combat pollution and later to address broader environmental issues, the MAP Phase II and the Barcelona Convention were amended in 1995 to focus on sustainable development and environmental protection. In 2012, the Contracting Parties to the Barcelona Convention adopted 11 Ecological Objectives (EOs) to achieve GES (Good Environmental Status), guiding efforts to protect and enhance the marine and coastal environment. These Ecological Objectives were implemented into an Integrated Monitoring and Assessment Programme (IMAP). The main product of IMAP is the Quality Status Report (QSR).

2. Further to an initial assessment of the status of the marine environment, the first-ever Quality Status Report for the Mediterranean (2017 MED QSR), progress was achieved by preparing the 2023 MED QSR using the findings of IMAP, implemented for the period 2017-2023. Compared to the 2017 MED QSR, the 2023 MED QSR benefited from a substantive improvement in terms of thematic and spatial data coverage. However, IMAP also faced several challenges with data inhomogeneity and uneven availability, preventing GES assessments for some of the indicators in the 2023 MED QSR.

[2] The box on "Highlights" comprises of new text developed by the Experts of the Working Group, in their effort to prepare a number of "Take-home" messages for the respective Ecological Objectives and Common Indicators.

3. In the framework of the UNEP/MAP Medium Term Strategy (MTS) 2022-2027, the Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) and its Protocols at their 23rd Meeting (COP23), took note of the 2023 Mediterranean Quality Status Report (2023 MED QSR) (UNEP/MED IG.26/Inf.10); endorsed its provisional Executive Summary, and mandated the preparation of the present Summary for Policy Makers as one of the communication products of the 2023 MED QSR. It is based on the work of a consultant and a dedicated Working Group, composed of some volunteer Contracting Parties, and supported by the Secretariat.

The Mediterranean Sea

4. The Mediterranean Sea's unique geographical and ecological characteristics, combined with significant human impact and economic activities, present complex challenges.

5. The Mediterranean Sea, a semi-enclosed body of water bordered by 21 countries, is uniquely connected to the Atlantic Ocean, Black Sea, and Red Sea. Its diverse geomorphology includes submarine canyons and numerous islands, creating a conducive environment for high biodiversity. The sea hosts approximately 17,000 species of fauna and flora, making it a critical hotspot for marine life.

6. The Mediterranean Sea exhibits significant seasonal and geographical variations in sea surface temperature, while its deep waters maintain a constant temperature and high salinity. It is recognized as one of the most oligotrophic marine systems, with nutrient inputs mainly originating from Atlantic waters. Climate change has exacerbated the region's vulnerabilities, leading to increased sea temperatures, marine heatwaves, and acidification, which disrupt marine ecosystems and affect the sea's overall health.

7. Human activities along the densely populated Mediterranean coast have led to substantial chemical pollution. The introduction of non-indigenous species (NIS) through corridors, shipping, aquaculture, and the aquarium trade has significantly altered native ecosystems. Unsustainable production and consumption patterns, characterized by high resource use and low recycling rates, further exacerbate environmental pressures.

8. Tourism is a major economic driver in the Mediterranean region, although the COVID-19 pandemic severely impacted this sector in 2020-2021. Agriculture, fisheries, and maritime activities heavily contribute to marine degradation, with nutrient runoff causing eutrophication, harmful algal blooms and pesticide infiltration in specific sectors. Fisheries, particularly small-scale operations, play a crucial role in the regional economy, while maritime transport is significant in the Mediterranean Sea, a worldwide transit area, lacking regulations and sustainable practices, and posing ongoing environmental challenges.

9. The demand for energy in the Mediterranean region has risen, with notable growth in renewable energy capacity, especially in power generation. Severe water scarcity, driven by population growth, urbanization, and climate change, remains a critical issue. Agriculture is the primary consumer of water, intensifying the region's water management challenges. Effective management strategies are essential to address these resource constraints and ensure sustainable development in the Mediterranean region.

The 2023 Mediterranean Quality Status Report

10. The 2017 Quality Status Report (MED QSR) for the Mediterranean Sea built on the IMAP structure, providing an overview of marine and coastal ecosystems and identifying knowledge gaps for future assessments. The 2023 MED QSR Roadmap focused on implementing priority activities, including support for national monitoring programs, harmonizing monitoring methods, operationalizing the IMAP Info System, and enhancing regional data-sharing partnerships.

11. Since 2017, data submission to the IMAP Info System has been significantly enhanced, and the system, developed by INFO/RAC, facilitates data access and processing. The 2023 assessment approach utilized all available IMAP data, supplemented by additional sources, including international databases (e.g., ACCOBAMS, EEA), national reports, regional projects, and policies. Assessments are organized by clusters (Pollution & Marine Litter, Biodiversity & Fisheries, and Coast & Hydrography) and are based on Common and Candidate Indicators. The 2023 MED QSR also implemented methods (e.g., NEAT, Nested Environmental status

Assessment Tool; CHASE, Classification of High and Stable Environmental States) to classify, integrate, and aggregate monitoring data and assess environmental conditions, and contribute to better environmental management and decision-making.

12. The 2023 MED QSR adopts the DPSIR framework, linking environmental drivers, pressures, states, impacts, and policy responses. Effective IMAP design requires bridging gaps between science and policy through a stronger science-policy interface (SPI), ensuring scientific outcomes inform policy and *vice versa*. This promotes evidence-based policies and mutual awareness of challenges and needs in monitoring.

Assessment Findings and Measures

1.1 Cluster Biodiversity

1.1.1 Biological Biodiversity

Ecological Objective 1 (EO1): Biological diversity is maintained or enhanced. The quality and occurrence of coastal and marine habitats and the distribution and abundance of coastal and marine species are in line with prevailing physiographic, hydrographic, geographic and climatic conditions)

Common Indicator 1: Habitat distributional range
Common Indicator 2: Condition of the habitat's typical species and communities
Common Indicator 3: Species distributional range
Common Indicator 4: Population abundance of selected species
Common indicator 5: Population demographic characteristics

13. The uniqueness of the Mediterranean biotope comes from a combination of morphological, chemical and biotic characteristics reflected by the presence of certain ecosystem building species and assemblages. The meadows formed by *Posidonia oceanica* and the bio concretions of the coralligenous assemblages are among the most characteristic marine features of the Mediterranean Sea. They provide a wide range of ecosystem services and sustain many human activities such as fisheries and tourism. They are, however, particularly sensitive and vulnerable to coastal urbanization, pollution, turbidity, anchorages, trawling, etc.

Common Indicator 1:

Key findings

14. The seabed and its benthic habitats are critical components of the Mediterranean marine ecosystem, providing essential services such as seafood provision, natural coastal protection, and carbon sequestration. Habitats' conditions are impacted across the Mediterranean Sea by various activities and pressure types. However, the current limitation of knowledge prevents the assessment of GES. There is a need to further develop and implement monitoring standards, data flow and assessment methods of impacts, for more habitat types (including pelagic habitats), in a complementary way of other EOs, especially EO4 (food webs) and EO6 (seafloor integrity).

15. For 2023, the assessment for Habitat Distribution and Condition (IMAP EO1 CI1 and CI2) is preliminary due to limited data, focusing on small areas and scattered data, related to some key habitats like Coralligenous, *Maerl/rhodoliths*, and *Posidonia oceanica* meadows in a few countries. However, it is well documented and assessed through other indicators, that coastal zones face severe pressure from infrastructure development, and offshore habitats are significantly impacted by bottom fishing and dredging. Below 1000 meters, bottom fishing is banned, protecting sensitive deep-sea habitats.

Recommended Measures to Achieve Good Environmental Status (GES) for Seabed Habitats:

- ✓ **Improving Habitat Maps** (quality and accuracy of habitat maps (i.e., bathymetry and geomorphology), encourage countries to contribute mapping data).
- ✓ **Mapping Activities and Pressures** (cost efficient assessments of seabed pressures, collect more data in the south and east Mediterranean).
- ✓ **Monitoring Seabed state** (validation of pressure data through direct observations /video /sampling, ensuring compatibility between countries).
- ✓ **Studying Pressure-State Interactions** (improve confidence in the use of calibration of state and pressure relationships).
- ✓ **Assessing Climate Change Effects** (better understand carbon storage capacity of sea beds, and blue carbon habitats like Posidonia oceanica meadows).
- ✓ **Developing Assessment Methods** (develop/test specific indicators, threshold values)
- ✓ **Visualizing Assessment Results** (demonstrate progress and actions towards GES).

Common Indicators 2, 3, 4, 5:

16. The Mediterranean waters are home to key species and sensitive ecosystems, whilst the deep waters host a unique and fragile fauna. Many of these species are rare and/or threatened and are globally or regionally classified by IUCN as “endangered” or “critically endangered”, such as the monk seal *Monachus monachus*, and cartilaginous fish species (sharks and rays). Many other species populations have strongly regressed during the 20^{th} century.

Key findings:

17. Without agreed thresholds, it was not feasible to assess Common Indicator 2 for EO1 habitat types for the needs of the 2023 MED QSR. However, rich scientific literature exists, describing the state of these habitats and provides evidence of poor state for many habitat types in multiple locations across the region.

18. The Monk Seal is a flagship species for the Mediterranean. Assessments show that GES for distribution (CI3) has not been achieved in all countries, but there is moderate range expansion. However, population abundance (CI4) lacks baseline estimates, making validation difficult. Demographic characteristics (CI5) require more detailed and long-term data.

19. The Mediterranean Sea hosts 25 cetacean species facing various human pressures. GES for cetaceans is challenging to assess due to recently defined baseline values. The IUCN Red-List shows many species are threatened, though some, like the common bottlenose dolphin, have improved status.

20. Seabirds play a crucial role in the Mediterranean ecosystem. While some species meet GES, data quality issues prevent a comprehensive assessment. Endemic species face multiple pressures, and improved monitoring and data collection are needed to achieve robust GES assessments.

21. Combining the findings of the 2023 MED QSR assessment regarding marine turtles (loggerheads and green turtles) with literature on research and conservation actions taking place in the Mediterranean, marine turtles can be considered as meeting GES in relation to CI3, CI4 and CI5. Their distribution is increasing, and nesting levels are stable or rising. However, gaps in monitoring and data reporting need to be addressed for better conservation outcomes, in particular in marine habitats.

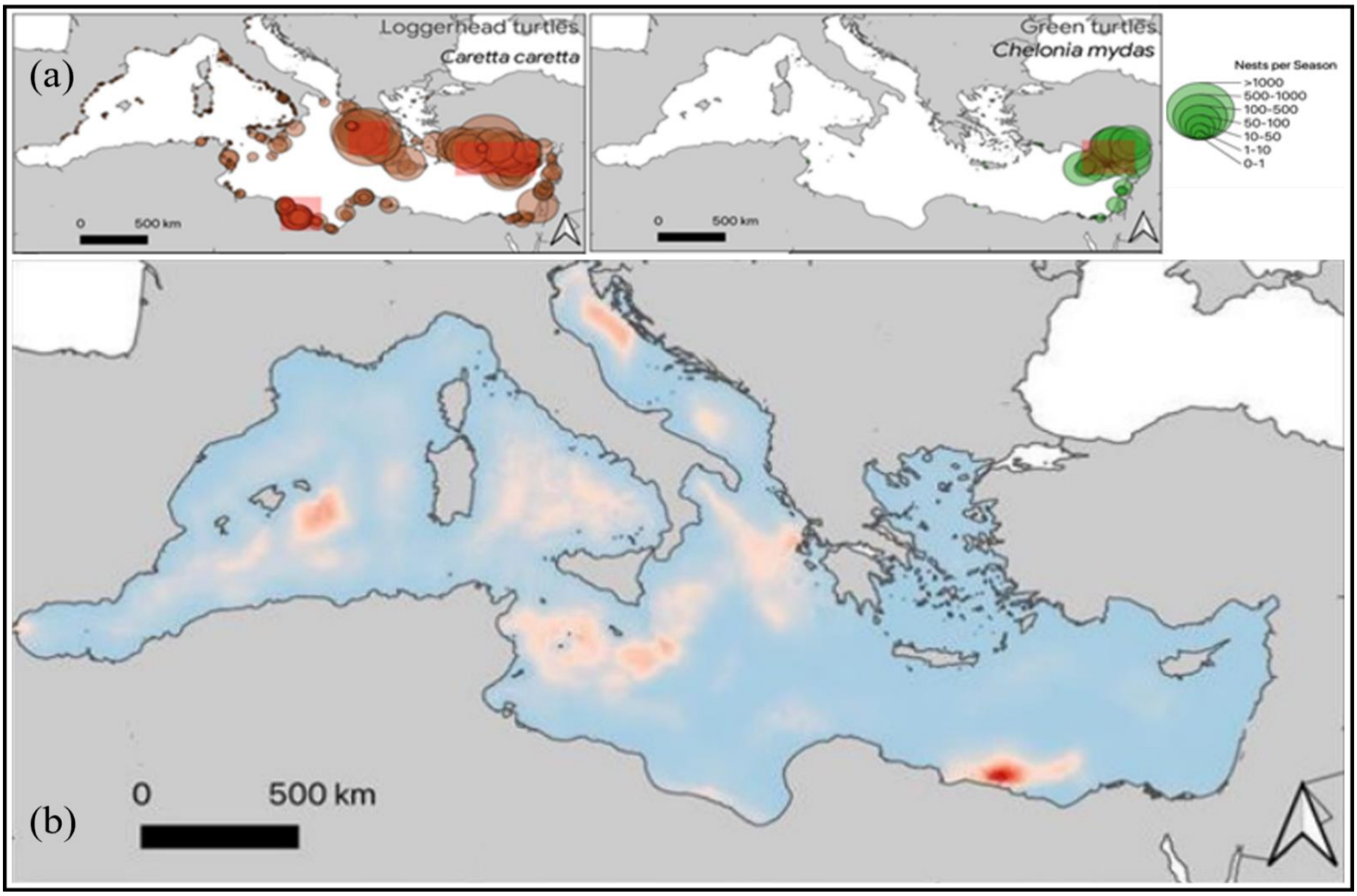


Figure 1: (A) Marine turtle nesting levels across the Mediterranean Sea. Green turtle nesting is confined to the eastern Mediterranean, mainly the extreme north-eastern area, and there are no large nesting aggregations for loggerheads in the western Mediterranean, though nesting levels are currently increasing. B) Turtle density (number of animals per 25km^2 grid cells) across the Mediterranean. Modelled distribution and abundance of hard-shelled turtles (mainly loggerheads) after DiMatteo et al. (2022). The hotspot off the Egyptian coast is generated from extrapolation and requires verification.

Recommended Measures to Achieve Good Environmental Status (GES) for marine Species

- ✓ **Support long-term monitoring for demographic data for Monk Seal:** networks, baseline population estimates, data-sharing platform for photo-identification.
- ✓ **Improve data collection and processing for cetaceans:** define pressure hotspots, assess ship strikes, and study climate change impacts, new methods for cumulative effects of pressures, support southern Mediterranean research and the implementation of mitigation tools.
- ✓ **Promote quantitative and standardized monitoring for Seabirds:** national and sub regional levels, address data biases, increase monitoring away from breeding colonies, and find a meaningful GES assessment spatial scale.
- ✓ **Coordinate monitoring for Marine Turtles:** ensure data from all monitoring programs are standardized and reported, align IMAP reporting with other international requirements, research priorities to include long-term monitoring, bycatch quantification.

Recommended Conservation and Management Measures

- ✓ **Regulation of Human Activities:** protect critical habitats, regulate and accompany fishing activities and mitigation efforts, educate the public and manage tourism.
- ✓ **Research and Monitoring:** better understand population dynamics and movements, key habitats, use new technologies.
- ✓ **Coordination and Data Sharing:** create platforms for data sharing, compatibility across regions.
- ✓ **Climate Change Adaptation:** assess and mitigate the impacts of climate change on key habitats and species, promote the use of renewable energy to reduce carbon emissions.

1.1.2 Non-Indigenous Species

Ecological Objective 2 (EO2): Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystem

Common Indicator 6: Trends in abundance, temporal occurrence, and spatial distribution of non- indigenous species (NIS), particularly invasive non-indigenous species, notably in risk areas.

Common Indicator 6:

22. Non-indigenous and invasive species (NIS) are increasingly present in the Mediterranean Sea. From the 1970's to 2020, more than 1,199 non-indigenous species have been reported, 513 of which are considered as established, mainly in the eastern Mediterranean Sea. Of those established species, 107 have been flagged as invasive. The NIS in the Mediterranean Sea are linked to four main pathways of introduction: the corridors, shipping (ballast waters and hull fouling), aquaculture, and aquarium trade. Corridors are the most important pathway of introduction (33.7%) followed by shipping (29%) and aquaculture (7.1%).

Key findings:

23. Most Contracting Parties have developed and are implementing IMAP-compliant monitoring programs and the IMAP Data and Information System is operational, receiving NIS data, facilitating the creation of standardized time series for the next assessment cycle.

24. Over the past 15-20 years, the rate of new NIS introductions has remained relatively constant in the Western Mediterranean and Adriatic Sea, slightly increasing in the Eastern Mediterranean Sea, and increasing in the Central Mediterranean Sea. Despite the constant annual rate, the cumulative number of NIS in the Mediterranean basin is steadily increasing, primarily through corridors and shipping pathways. There has been a significant increase in monitoring and reporting efforts, driven by policy requirements, scientific interest, and citizen science initiatives, especially in the southern Mediterranean. However, interpretation of trends is complicated by the lack of long-term standardized monitoring data, making it difficult to distinguish between real changes and variations in recording efforts.

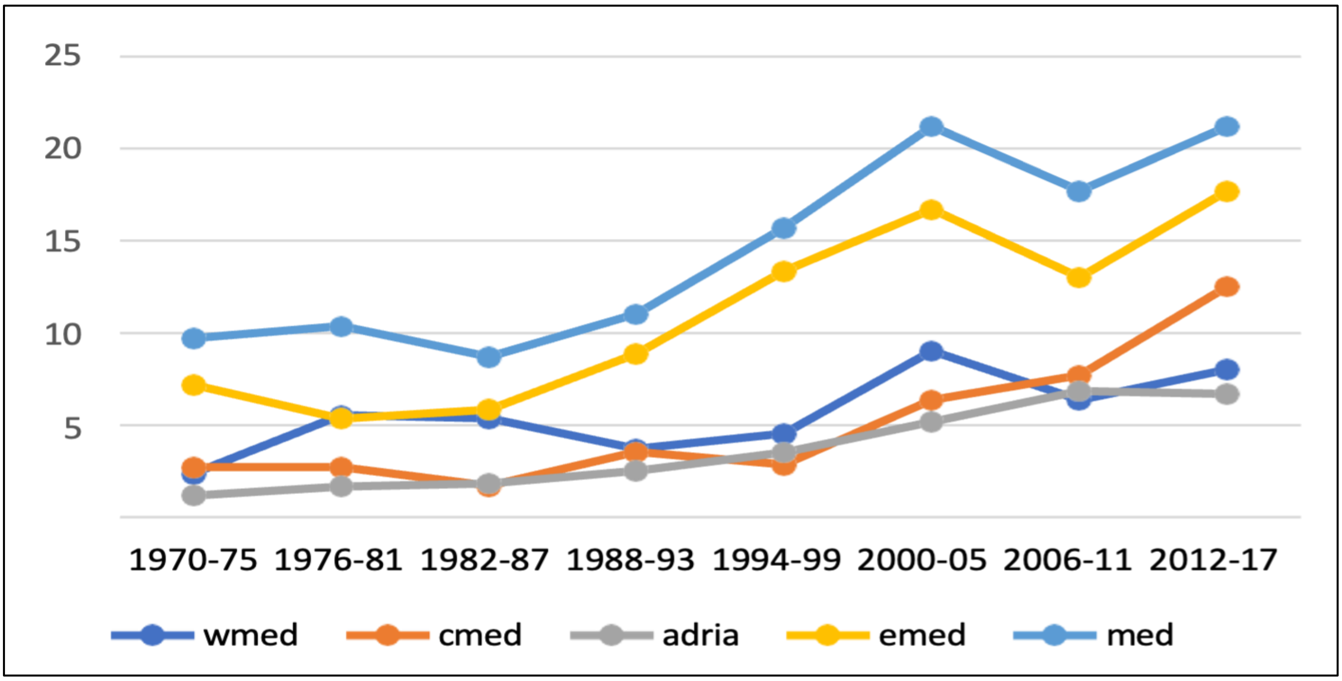


Figure 2: Non indigenous Species introduction rates per period at the level of Mediterranean Sea (med), Western Mediterranean (wmed), Central Mediterranean (cmed), Adriatic Sea (adria), and Eastern Mediterranean (emed).

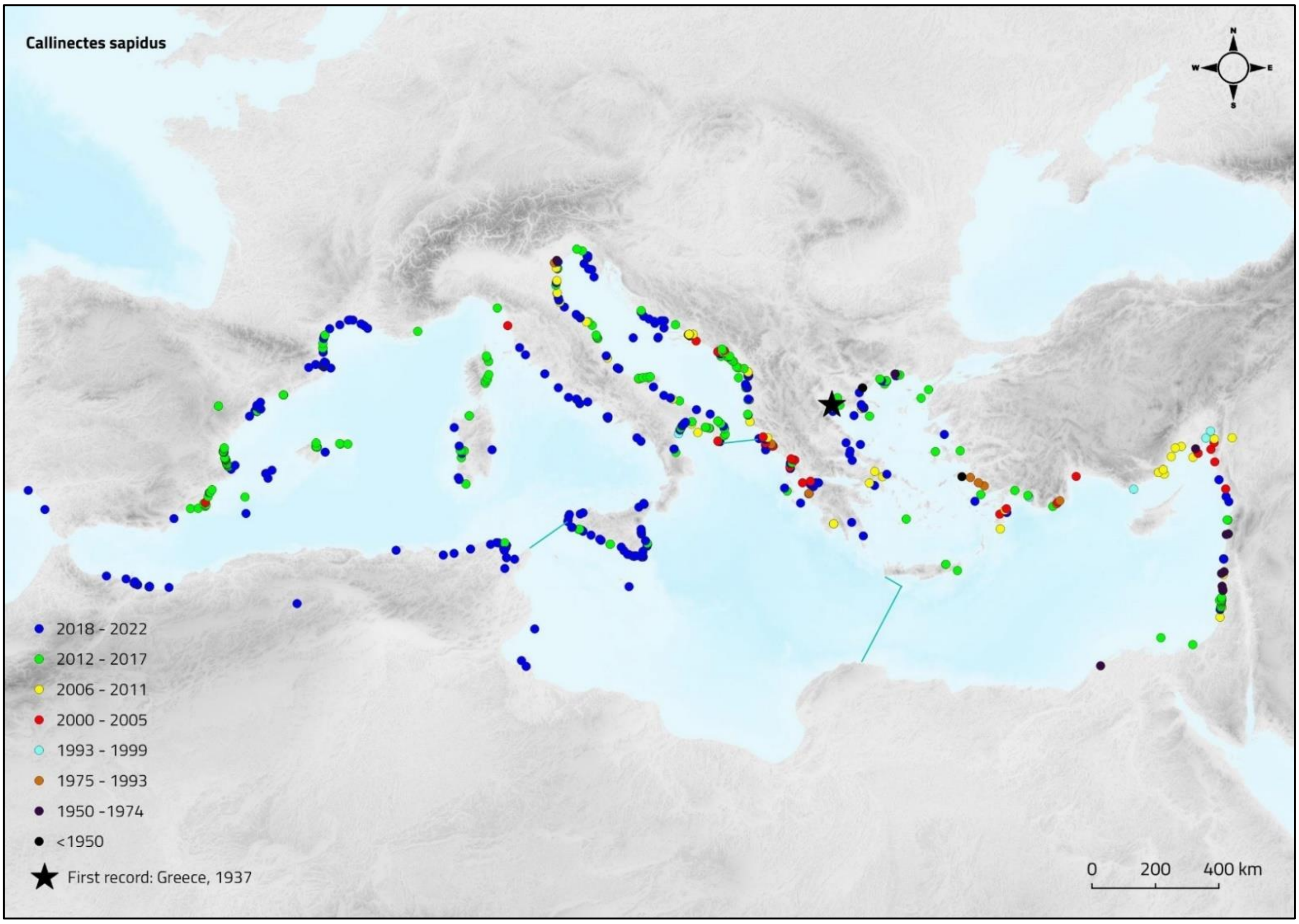


Figure 3: Distribution of Callinectes sapidus in the Mediterranean Sea. Colour symbols correspond to different 6-year reporting periods, corresponding frequency histograms depict number of records in each time bin.

25. Several high-impact NIS have expanded geographically in the last decade, even amid increased detection and reporting efforts. NIS with warm affinities and long-range pelagic dispersal have been favored by climate change, allowing them to establish in cooler regions of the Mediterranean, while anthropogenic dispersal remains a key factor in their spread.

Recommended Actions to Achieve GES for EO2 Common Indicator 6:

- ✓ **Improve data Availability, Monitoring Programs**: methodologies to quantify pathway pressure, common methodology to address reporting lags in new NIS data and trends.
- ✓ **Developing Assessment Criteria and Quantitative Targets**: further develop of assessment criteria and quantitative targets for the most vulnerable/important species and habitats at risk, coordination with EO1 Common Indicators CI1 and CI2 and EO6 on sea floor integrity.
- ✓ **Preventative Measures and Legislative Framework**: updated Action Plan to strengthen legislative and institutional frameworks to systematically assess and manage pathways, development of early warning systems, rapid response plans, and mechanisms to control intentional introductions, targeted impact studies for priority species.
- ✓ **Ballast Water Management (BWM) Strategy:** the NIS Action Plan must progress alongside the BWM Strategy for the Mediterranean 2022-2027, focusing on managing ship-mediated introductions from ballast water, national strategies to manage biofouling.

1.1.3 Populations of Commercial Species

Ecological Objective 3 (EO3): Populations of commercially exploited fish and shellfish are within biologically safe limits, exhibiting a population age and size distribution that is indicative of a healthy stock

Common Indicator 7: Spawning stock Biomass
Common Indicator 8: Total landings
Common Indicator 9: Fishing Mortality

26. Fishing is woven into the soul of the Mediterranean, its culture and traditions. Around 80,000 fishing boats ply the waters of the Mediterranean, providing a livelihood for 180,000 people and supporting an industry worth €4.6 billion. A large part of fish stocks is still overfished in the Mediterranean because of increased fleet capacity, illegal fishing, and catches of unwanted species.

Key findings

27. For Common Indicator 7 (spawning stock biomass), some species under management plans are showing increased biomass due to decreased fishing pressure, while others show no improvement. Across the region, 44% of stocks have low biomass, 19% intermediate, and 37% high.

28. For Common Indicator 8 (Total Landings), capture fisheries production has stalled since the mid-1990s, with a decrease in 2020 likely due to the COVID-19 pandemic. Average annual landings for the Mediterranean and Black Sea (2018–2020) were 1,189,200 tons, similar to the 2016–2018 average. However, there was a 16% decline in 2020 compared to 2019, possibly due to the pandemic's impact on fleet dynamics, demand, and trade. The Mediterranean Sea alone accounted for 743,100 tons (62% of the total capture fish production).

29. For Common Indicator 9 (fish mortality), overexploitation of stocks has decreased over the past decade, with an accelerated reduction in the last two years, especially for species under management plans. Most commercial species remain overexploited, with fishing pressure still double what is considered sustainable (average F/FMSY = 2.25). There has been a 10% decrease in overexploitation since 2012 and a 21% reduction in fishing pressure since 2012. Key species like European hake and common sole have seen significant declines in fishing pressure, but pressure on blue and red shrimp continues to increase in the central and eastern Mediterranean.

Recommended measures to Achieve GES for EO3 Common Indicators (commercial species):

- ✓ **Extending Assessment Coverage to maintain comprehensive data:** coverage of all regions, regular assessment of key stocks with high landings**.**
- ✓ **Adopting Management Measures:** multiannual management plans, effort control, quota-based management, fisheries restricted areas, and spatio-temporal limits to protect essential habitats and life stages.
- ✓ **Improving Scientific Advice and Data Collection:** research programs and pilot studies incorporated into GFCM workplans, scientific data collection and analysis on specific themes, fisheries, or species.
- ✓ **Better estimation of Fishing Mortality:** understand fishing capacity, particularly the large proportion of small-scale polyvalent vessels, use long time series, and incorporate environmental and ecosystem variables.
- ✓ **Data Collection and Submission:** link with the GFCM Data Collection Reference Framework (DCRF), harmonized scientific surveys and data collection.
- ✓ **Accurate Estimation of Total Landings:** improve the monitoring of landings, especially from small-scale polyvalent vessels and varied landing sites, consider various factors affecting total catch/landings**.**

1.2 Cluster Pollution and Marine Litter

1.2.1 Eutrophication

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

Common Indicator 13: Concentration of key nutrients in water column
Common Indicator 14: Chlorophyll-a concentration in water column

30. Eutrophication corresponds to an artificial enrichment of water with nutrients of industrial or agriculture origin, which can disrupt the biological balance of water, resulting in an increased growth of microorganisms that can negatively impact water quality by reducing dissolved oxygen levels. Nutrient enrichment may provoke harmful and toxic algal blooms, causing negative impacts on ecosystems (red-tide, mucilaginous production, biomass accumulation leading to anoxia) and may present serious economic threats for fisheries, aquaculture and tourism. Eutrophication monitoring in the Mediterranean Sea is based on the measurements of dissolved inorganic nitrogen (DIN), and total phosphorus (TP) concentrations for Common Indicator 13, and Chlorophyll ‘a’ concentration (Chl-a) for Common indicator 14 as indicator of direct effects of nutrient enrichment.

<u>Common Indicators 13, 14:</u>

Key findings

31. **Different assessment concepts were used for assessment of C1s 13 and 14, based on the availability of data as delivered by the CPs through the four Mediterranean Sub-regions;** A complete GES assessment for CIs 13 and 14 for all the sub-regions was not possible given the high heterogeneity of type of data and spatial coverage, and the lack of quality-assured, homogenous data. More precisely, in the absence of reported in situ data in the Western and Central Mediterranean Sea sub-regions, as well as in the Aegean and Levantine Seas sub-regions, satellite-derived data of Chlorophyll-a concentrations, provided by either national or European providers had to be used to compensate. **In the Aegean region,** eutrophication is related to the area being one of the most densely populated areas in the world, also linked to urban wastewater, agriculture, riverine discharge, tourism, port operations, and aquaculture. Izmir province and its southern coast (Küçük Menderes, Bakırçay, and Gediz rivers) are significantly affected impacted. Other non-good status areas include such as, Saronikos Gulf, and Thermaikos Gulf, influenced by urbanization, riverine inputs (e.g. Axios River), industry, and agricultural discharges.

32. In the Levantine basin, most evaluated assessment zones can be considered in good status for Chlorophyll ‘a’. Detailed examination showed that only 1 out of 18 units, in the open waters was classified in non-good status (southern Levantine Sea), due to high population density and untreated wastewater. The primary drivers and pressures include agriculture, tourism, urbanization, sewage discharge, desalination.

33. In the Adriatic Sea, the overall status assessed through the NEAT tool] is a Good Environmental Status for all 3 parameters (Total Phosphorus (TP), Dissolved Inorganic Nitrogen (DIN), and Chl-a), with the exception of localized assessment units showing moderate non-GES status for total phosphorus (TP) in few coastal assessment units in the Central Adriatic along the Abruzzo Coast and several coastal and offshore units in the South Adriatic, near the Apulia coast. There, the primary drivers and pressures include aquaculture, tourism, are critical in affecting the natural cycle of nutrients. However, although the two drivers, aquaculture and coastal and maritime tourism, are present in other areas of the Adriatic Sea, they did not impact CI 13 nor CI 14, as represented by the available data.

34. There is limited data in the Central Mediterranean Sea sub region, with 7 out of 36 units in good status in the Eastern and the Southern parts of the central sub-region. Affected areas (GES not reached) were found in Greece (Ambracian and Patras gulfs, Igoumenitsa) , western Libya, and Tunisia (Gulf of Gabès) due to: (i) large urban centers; ii) untreated domestic discharges; iii) industrial discharges, among them phosphogypsum; iv) agrochemical industry; and v) agriculture.

35. Finally, in the western Mediterranean Sea, several differences between thresholds calculated from satellite data and assessment criteria calculated from *in situ* measurements (regional assessment findings) were observed. Some assessment units are in non-good status in Spain, France, and Italy (in Spain, 8 out of 70 units, including Mar Menor Segura River mouth; Ebro River mouth; French border; Mallorca Island/ Alcudia Gulf), influenced by riverine discharges, urbanization, and tourism, while the main drivers and pressures are agriculture, industry, tourism, and urban development. In the waters of Italy, there are 9 out of 54 sub units in non-good status (Arno and Tiber River mouths; Napoli urban area, SW Sardinia Island). In French waters, 1 (Gulf of Porto Vecchio) out of the 46 Sub units was in non-good status due to the resolution and associated uncertainties integrated into the assessment based on satellite-derived products for Chl-a concentrations.

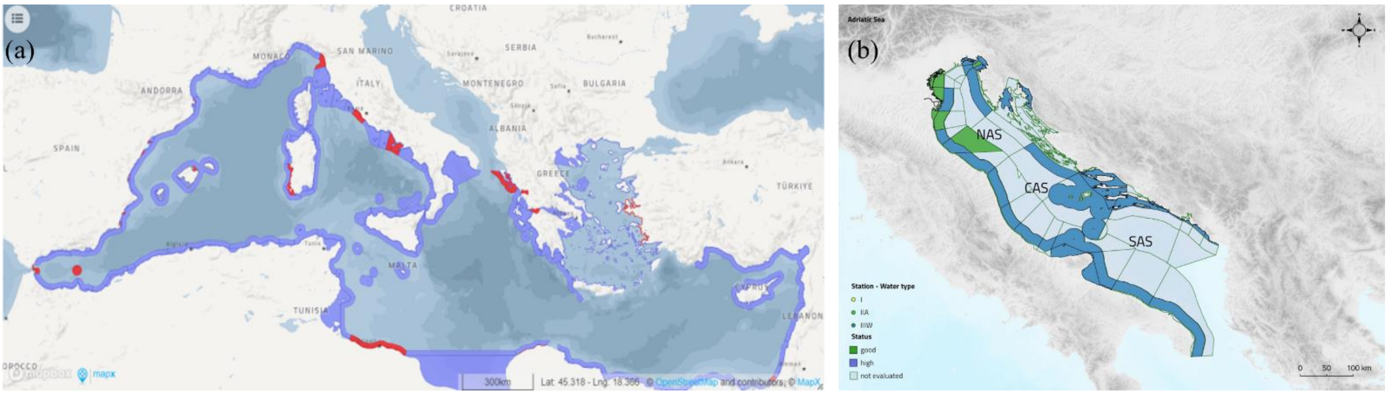


Figure 4: Assessment of Eutrophication (EO5), providing an indication of possible good/non-good status at the level of the sub-Mediterranean regions: (a) Western, Central and Levantine Basins (in situ and satellite derived data) (Red: non-GES, Blue: GES); (b) Adriatic Sea.

Recommended measures to Achieve GES for EO5 Common Indicators (Eutrophication):

- ✓ **Improve data availability and quality through enhanced monitoring methodologies and reporting**: Best Available Technology and Best Environmental Practices, including the use of satellite imagery.
- ✓ **Promote sustainable practices in aquaculture, agriculture, industry, tourism:** water treatment, limited use of fertilizers.
- ✓ **Develop adaptive management strategies**: strengthen regional cooperation, and policy integration to address pollution and achieve GES.

1.2.2 Chemical Pollution

Ecological Objective 9 (EO9): Contaminants cause no significant impact on coastal and marine ecosystems and human health	
Common Indicator 17:	Concentration of key harmful contaminants measured in the relevant matrix (biota, sediment, seawater).
Common Indicator 18:	Level of pollution effects of key contaminants where a cause-and-effect relationship has been established.
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.
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.
Common Indicator 21:	Percentage of intestinal enterococci concentration measurements within established standards.

36. Pollution is the destruction or degradation of an ecosystem or the natural environment through the introduction, usually by humans, of chemical entities (contaminants) detected in a place where they are not normally found. Despite advances in terms of pollution prevention at source, pressures persist in the Mediterranean Sea. The context around the capacity to achieve a cleaner Mediterranean is complex and evolving. The environment is changing, as are societies, while key drivers, such as climate change and its impacts, are also changing the conditions. In recent years, there have been determined efforts to instill more preventive, circular and sustainable approaches in the Mediterranean region to limit pollution. However, the level of progress remains heterogeneous among the sub regions.

Common Indicator 17:

Key findings

37. **Different assessment concepts were used for assessment of C17 by the Contracting Parties, based on the availability of data, including NEAT (spatial integration from Spatial Assessment Unit level to Sub region level) in the Adriatic and Western Mediterranean Seas, and CHASE+ (environmental assessment providing GES/non-GES status classes at the level of the monitoring stations) in Aegean, Levantine and Central Mediterranean Seas. While NEAT tool provides the results in five classes, CHASE+ indicate the likely environmental status of the Subdivision or areas within the Subdivision, expressed as likely GES or likely non-GES. Therefore, the CHASE+ results should be considered as an initial environmental assessment. The decision rule agreed for CHASE + assessment methodology recommends that only if at least 75% of the elements are in GES, the area should be considered in GES.**

38. The **Aegean Sea sub-division** is likely non-GES, and only 67% of the stations were in GES for TM in sediments as a result of the contribution from only two limited affected areas including i) the Elefsis Bay and inner Saronikos Gulf (Pb and to a lesser degree Cd), and ii) the Aliaga and Yenisakran (Hg and to a lesser degree Pb). Due to the lack of data reported, it was impossible to classify the Aegean sub-division regarding Σ16 PAHs in sediments. Only indications exist for the offshore zone under GES, while the enclosed areas might be found as non-GES. The Aegean sub-division was classified as likely non-GES regarding Σ5 PAHs in sediments (non-mandatory), due to the two areas being limited in spatial scope i) the Elefsis Bay and inner Saronikos Gulf and 2) the area encompassing the coast around Kucukkoy, Dikili, Candarli, Aliaga, and Yenisakran. The southern part of the Aegean sub-division can be classified as likely in GES.

39. In the Northern and Eastern Levantine Seas, only 69% of the stations were in GES for trace metals, as a consequence of only the two affected areas: i) the Northern Haifa Bay in Israel (Hg concentration, nonGES/ moderate status), and ii) the Dora region (off Beirut), followed by area in the North Lebanon (Cd and Hg concentrations ; nonGES/ moderate status), There is insufficient data for Σ7 Polychlorinated Biphenyls (PCBs), which hinders a comprehensive assessment. The Dora region off Beirut was affected with primary drivers and

pressures impacting this region (urban development, industries, wastewater discharges). Although drivers and pressures and non-GES statuses were identified for the CI 17 in the Levantine Basin, essentially no impact was detected using the fish species *Mullus barbatus*, when available. Only one non-GES units (1 out of 15) was found off Paphos (Cyprus) due to the accumulation of Hg, a contaminant also found at high level in another species in Haifa bay. It should be emphasized, that concentrations not in-GES do not necessarily imply a biotic effect.

40. As for contaminants in sediments in the Adriatic Sea, 80% of assessment units are in Good Environmental Status, while 20% are classified as non-GES, with the highest contamination from Polychlorinated Biphenyls (PCBs), Polycyclic Aromatic Hydrocarbons (PAHs), and mercury (Hg). For mussels, the highest contamination is observed for PCBs which results in 39% of Spatial Assessment Units in non-GES status. In the Northern Adriatic, 19% of the Spatial Assessment Units were in non-GES (3 in Croatia, 3 in Emilia-Romagna and ‘Veneto in Italy, 2 offshore units in Italy and Slovenia), because of Hg contamination (moderate status) in sediments and mussels, and PCBs (poor status) contamination in sediments. Most sub-Spatial Assessment Units are classified under High or Good status and in GES in Central Adriatic Sea. while one coastal unit in Croatia (Hg in sediments and Σ7 PCBs in mussels), and one offshore Unit in Italy (Hg in mussels), are classified under Moderate status. In the South Adriatic, most spatial assessment units were classified under high or good status. There was 1 coastal assessment unit in Boka Kotorska Bay in Montenegro, due to the high concentrations of Mercury, some of 16 PHs and 7 PCBs in sediments, and relatively lower levels of lead in sediment and mussels. The primary drivers and pressures contributing to this contamination include industrial activities (dumping, waste discharge), tourism (waste water), port operations and maritime traffic that are significant in the Adriatic Sea. Dumping area for dredging in Emilia Romagna was also identified.

41. In the central Mediterranean region, there is insufficient data for a comprehensive classification, though most units are in Good Environmental Status (GES) for trace metals. Regarding Σ5PAHs in sediments, Non-GES units were located at the north-eastern and south eastern part of Malta (Port ill- Kbir off Valetta, Wied Ghammieq), and Greece (Gulf of Patras, Gulf or Corinth, Corfu). About impacts on mussels, 8 units were in-GES for trace metals, while for fish (*Mullus barbatus*) 5 units were classified as non-GES (Hg). The primary drivers and pressures impacting specific areas include industrial plants and maritime traffic.

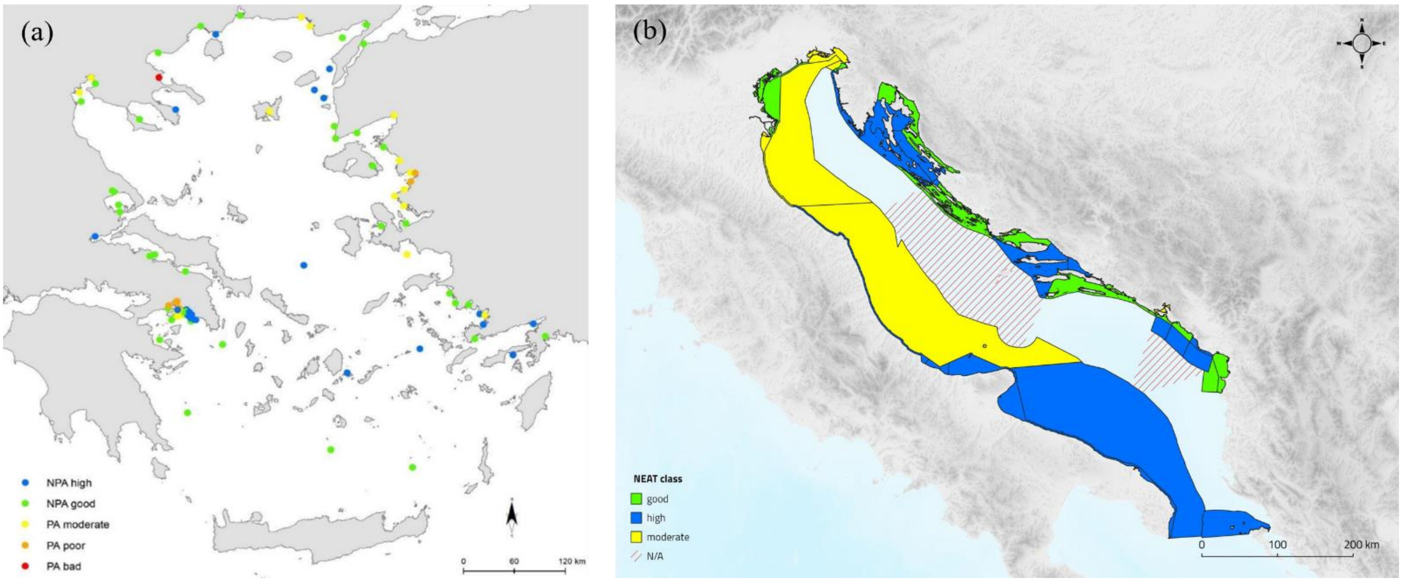


Figure 5: Examples of aggregation of results for contaminants: (a) the Neat assessment results for IMAP Common Indicator 17 (CI17) in the Adriatic Sea region (aggregation of all contaminants per sub-unit); (b) results of the CHASE+ assessment methodology to assess the environmental status of Σ5 PAHs in sediments in the Aegean Sea.

42. In the western Mediterranean Sea, without data for the southern coast (Algeria, Tunisia). The current status indicates that the Alboran Sea is in Good status (metals in sediments, Cd and Pb in biota), while Off Morocco, 2 units were in moderate status (one for Cd in sediments, one for Pb in sediments). GES has not been reached in one unit along the Spanish coast and another one in France (moderate status, Hg in sediments, Hg and CD in biota in biota), while two units in France were affected by Σ16PAHs in biota. In the Central Western Mediterranean Sub-divisions, 6 out of 7 units were classified in high or good status and one unit was classified as

non-GES (Hg, PAHs, and PCBs). While the Tyrrhenian Sea is in Good Environmental Status, several non-GES parameters were identified for some units in Italy (Cd and Hg in sediments, Σ16PAHs and Σ7PCBs). Large Ports and maritime traffic, Coastal urbanization, Tourism, Riverine discharge, Agriculture and aquaculture, Desalination were the most common pressures. Essentially no impact was detected in the environmental status classification of biota.

<u>Other Common Indicators:</u>

Key findings

43. **For Common Indicator 18**, there is no available data to assess pollution effects on biota in Aegean Sea. In the Levantine basin, although drivers that could exert pressure and cause impact on CI18, were identified, no data were available for impacts on biota. Only two studies on biomarkers showed indications of possible effect of Trace metals in the mollusk *Ruditapes decussatus* from Port Said (Egypt) and in the fish *Mullus barbatus*, *Boops boops* and *Trachurus trachurus* off the coast of Türkiye. Only one study from the scientific literature reported impact of PAHs on some of the biomarkers measured in the specimens of the fish *Mullus barbatus* collected in an important fishery area in the Northern Adriatic Sea (offshore Rimini to Ancona). In the central Mediterranean Sea, with 5 studies for Tunisia and 1 from Italy, biomarker responses were influenced also by seasonality, tissue analyzed, spawning status, and species. Drivers and pressures reported in the scientific literature, encompassed the whole range of them: domestic and industrial discharges, agricultural and riverine runoff, fisheries, harbor and marina utilization, maritime activities, and tourism. Finally, while pressures were identified, there is no available data on pollution effects. In the western Mediterranean Basin, there is no available data on pollution effects.

44. **For Common Indicator 19**, assessment shows a non-Good Environmental Status (non-GES) due to acute pollution events, primarily oil pollution in the Aegean Sea. The pollution effects also indicate a non-GES (Poor status) in the North Adriatic for pollution effects and a moderate status in other areas of the same basin. A good GES status was found for acute pollution events in the Central Mediterranean basin. Finally, a poor status was found in the Alboran Sea, and a moderate status for the other parts of the Mediterranean Sea. In addition to anthropogenic stressors, biomarker responses were influenced also by seasonality, tissue analyzed, spawning status, and on species identity.

45. **For Common Indicator 20**, while drivers that could exert pressure and cause impact were identified in the basin, no impact has been detected on seafood safety. Out of the 23 studies found in the literature for the Aegean and Levantine basins, 87% reported concentrations of Trace Metals and organic contaminants below the concentration limits for the regulated contaminants in the EU, 4% reported concentrations above the limits but without risk to human health and 9% reported concentrations above the limits for the regulated contaminants with probable risk to human health. In the Central Mediterranean Sea, while some biota samples have higher than threshold levels of Hg, they remain below EU regulatory limits. In the Western basin, no impact was detected on seafood safety while most bathing waters are in excellent or good status, with some poorly classified units in Morocco. Drivers and pressures reported in 15 relevant studies (4 from Algeria, 2 from Italy, 5 from Spain and 4 from Tunisia), encompassed domestic and industrial discharges, agricultural and riverine runoff, fisheries, harbor and marina utilization, maritime activities, tourism. For 20 out of the 37 studies found in the literature, 78% reported concentrations of Trace Metals and organic contaminants below the concentration limits for the regulated contaminants in the EU and 11% reported concentrations above the limits but without risk to human health. Possible impact was detected in 11% of the studies that reported concentrations above the limits for the regulated contaminants with probable risk to human health.

46. **For Common Indicator 21**, limited data indicates that some areas from the Aegean Sea are in non-good status due to high concentrations of enterococci. In the Levantine Basin, mixed results were obtained, with some areas, particularly in Beirut (4 of 38 stations in Lebanon), in non-good status with probable drivers being urban development and industry, discharge of wastewater through marine outfalls and riverine discharge. In the Adriatic Sea, most bathing waters are in good to excellent status, although some areas in Italy and Albania have poor classifications. Drivers that could exert pressure and cause impact on CI 21 were also detected in the Western Mediterranean Sea, and among them the following: tourism, sporting and recreational activities; ports and maritime works, maritime activities. However, essentially no or very limited impact was detected.

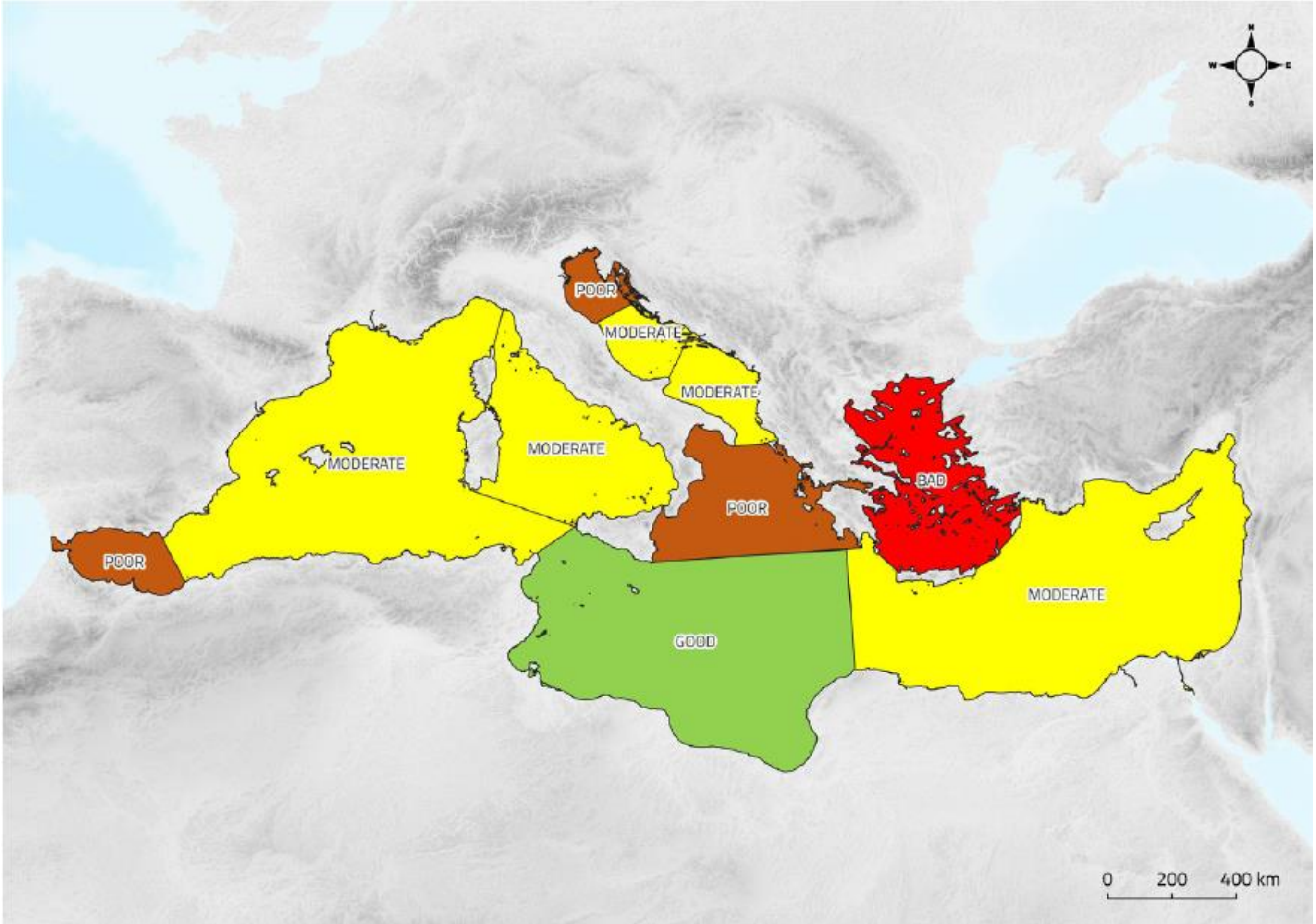


Figure 6: Map of the assessment of the marine environment status for CI 19 for the sub-divisions of the Mediterranean Sea. (Note: assessment results derive from data extrapolation at the scale of each sub region).

Recommended measures to Achieve GES for EO9 Common Indicators (Chemical pollution):

Noting the lack of data on organic contaminants in sediments and biota across all Mediterranean sub-regions, the limited IMAP data other than from **European Environmental Agency (EEA)** and scientific literature for CI 20 and 21 a number of recommendations are key:

- ✓ **Improve data availability and quality:** harmonized monitoring and reporting, capacity building, Best Available Technology and Best Environmental Practices, consistent sampling, quality assurance.
- ✓ **Specific actions for Common Indicators:** CI17: Update environmental assessment criteria and extend monitoring to emerging contaminants; CI18: Develop and apply new biomarkers and environmental risk analysis tools; CI19: Improve data collection on pollution events and impacts, and define operational criteria; CI20: Harmonize species selection for monitoring and incorporate human health risk assessments; CI21: Ensure consistent and comprehensive data reporting for bathing water quality assessments.
- ✓ **Update Environmental Assessment Criteria:** update the list of priority pollutants and commonly agreed IMAP Pollution species, utilize a database of scientific literature and methodologies to derive EAC values, focusing on Mediterranean Sea biota species, update Sub-regional and regional Thresholds to ensure Mediterranean-specific criteria.
- ✓ **Integrate Data for Environmental Risk Analysis:** combine chemical and ecotoxicological data to support risk evaluation for marine organisms.
- ✓ **Promote sustainable practices** in aquaculture, agriculture, industry, tourism, and maritime operations.
- ✓ **Tailor regional and national plans:** track the effectiveness of measures in areas classified as non-GES or likely non-GES, Strengthened regional cooperation and policy integration.

1.2.3 Marine Litter

Ecological Objective 10 (EO10): Marine litter does not adversely affect the coastal and marine environment
Common Indicator 22: Trends in the amount of litter washed ashore and/or deposited on coastlines Common Indicator 23: Trends in the amount of litter in the water column including microplastics and on the seafloor

47. Marine litter in the Mediterranean Sea is a growing environmental concern, with plastics making up the majority of the waste found in marine environments. This pollution not only affects marine wildlife, causing injuries and fatalities through ingestion and entanglement, but also poses significant threats to human health and coastal economies. The Mediterranean has some of the highest levels of marine litter in the world, with densely populated coastal areas and high tourism rates contributing to the problem. Additionally, the semi-enclosed nature of the Mediterranean basin means that litter tends to accumulate and persist over time. Regional cooperation, continuous monitoring and stricter enforcement of regulations are essential to effectively combat marine litter in the basin.

<u>Common Indicator 22:</u>

Key findings

48. A total of 931 beach surveys were conducted, collecting approximately 300,000 marine litter items from the Mediterranean coastline. Only 16% of monitored beaches achieved Good Environmental Status (GES), with 79% not meeting GES criteria. Of the latter, 29% were classified as poor and 25% as bad. Beach litter concentration varied significantly, ranging from 8 to 47,361 items per 100 meters, with an average of 961 ± 3664 items per 100 meters. The Central Mediterranean had the least beach litter (32% of 22 beaches monitored achieved GES). The Adriatic, Eastern, and Western Mediterranean had similar distributions of beaches under GES (14-16%) and non-GES (84-86%). The most common items were plastic/polystyrene pieces (2.5 cm – 50 cm), cigarette butts and filters, and plastic caps and lids, comprising approximately 60% of recorded litter.

<u>Common Indicator 23:</u>

Key findings

49. For floating marine litter, the total number of floating mega-litter was estimated at 2.9 million items and average density 1.5±0.1 items per km2, with a high variability, however. Data from the ACCOBAMS Aerial Survey Initiative (ASI) in summer 2018 indicated that only 20% of the Mediterranean was free of floating mega-litter. Highest concentrations were found in the central and western Mediterranean (Tyrrhenian, northern Ionian, Adriatic Seas, and Gulf of Gabs) and lowest in the Levantine basin, southern Ionian Sea, and Gulf of Lion. Plastics constituted 68.5% (plastic bags, bottles, toys, etc.), fishery debris 1.7%, and anthropogenic wood-trash 1.9%. The remaining quarter (27.9%) was anthropogenic mega-litter of an undetermined nature.

50. Seafloor litter concentrations ranged from 0 to 28,228 items per square kilometer, with an average of 570 ± 2,588 items per square kilometer. The majority (88%) of seafloor stations did not achieve GES, with 23% in poor and 53% in bad status classes. Western Mediterranean was most affected (100% non-GES), followed by Central Mediterranean (81% non-GES), Adriatic (65% non-GES), and Eastern Mediterranean (68% non-GES). Up to 10% of recorded litter was fishery-related items, including synthetic ropes/strapping bands (39%), fishing nets (27%), and fishing lines (25%), noting that while fishing gear is a small percentage of the marine litter, it has big effects, like ghost nets.

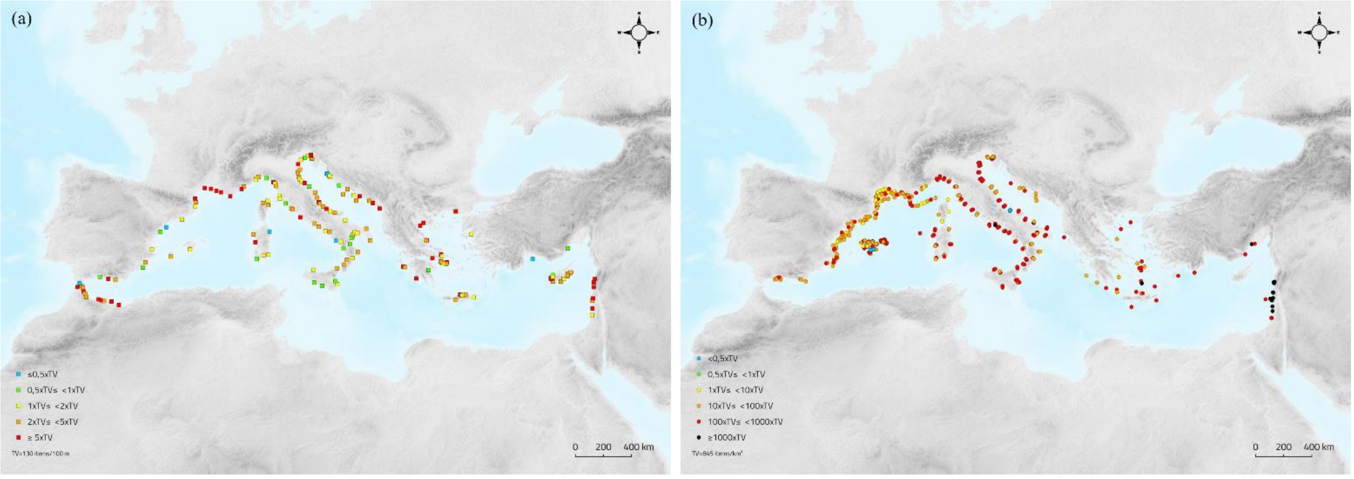


Figure 7: GES assessment classification for: (a) beach macro-litter (CI22); and (b) floating microplastics (CI23) in the Mediterranean Region.

51. For floating microplastic concentrations, almost all monitored stations (99%) did not achieve GES, with 44% in poor and 49% in bad status classes. Microplastics concentrations varied from 0 to 31 items per square meter, with an average of 0.355 ± 1.99 items per square meter. The most common types were Sheets (37%), Filaments (30%), Pellets (21%), Fragments (7%), Foam (4%), and Granules (1%).

Recommended measures to Achieve GES for EO 10 Common Indicators (Marine Litter):

- ✓ **Addressing Assessment Findings and Knowledge Gaps:** link monitoring and assessment with measures, target specific marine litter items like cigarette butts and plastic bottles, promote behavioral changes, prevention measures, recycling, alternative materials and extended producer responsibility schemes.
- ✓ **Microplastics Management:** enhance management of microplastics through waste water management, regulatory approvals, education, Control sludge management.
- ✓ **Household and Industrial Measures:** ban single-use plastics, promote behavior changes, improve textile designs, and develop household systems to prevent microplastics release.
- ✓ **Riverine and Storm Water Management:** implement measures to control litter in riverine systems and urban storm water management plans to minimize plastic leakage into rivers and oceans.
- ✓ **Sea based sources:** implement best practices for fishing vessels to retrieve derelict gear and deliver it to port facilities. Address abandoned, lost, and discarded fishing Gear through FAO guidelines, Introduce measures to reduce marine litter from aquaculture, minimizing single-use plastics, and raising awareness among staff.
- ✓ **Policy and Regulation Enhancements:** introduce prevention measures to minimize plastic production and consumption, revise legal frameworks, and develop compulsory Extended Producer Responsibility systems, Strengthen links to global initiatives and policies, such as UNEA resolutions, UNEP partnerships, and the IMO Action Plan.

1.3 Hydrographic Conditions, Coastal Ecosystems and Landscapes

Ecological Objective 7 (EO7): Alteration of hydrographical conditions
Common Indicator 15: Location and extent of the habitats impacted directly by hydrographic alterations

52. The circulation of the Mediterranean Sea is driven by several forces, external ones, like wind stress, strong topographic constraints and internal dynamic processes. The emerging Mediterranean general circulation, therefore, encloses three predominant and interacting spatial scales: basin scale, sub-basin scale, and mesoscale. All countries had difficulties with the monitoring of the EO7 indicators and could therefore provide limited monitoring data. Climate change seems to have far bigger impacts on the habitats and marine ecosystems in general than the impacts of hydrographic alterations caused by new structures.

Common Indicator 15:

Key findings

53. Countries have faced significant difficulties in monitoring Common Indicator 15 (CI15), which pertains to the location and extent of habitats directly impacted by hydrographic alterations. As a result, the Good Environmental Status (GES) for this indicator has not been assessed. To address these challenges, a simplified Guiding Factsheet is needed to help countries report on physical habitat loss due to structures' footprints, noting that coordination with EO1 (Biodiversity) and EO6 (Seafloor Integrity) is essential for defining GES.

54. A baseline assessment was conducted using data from national reports prepared under EcAp MED III and IMAP MPA projects, as well as data from scientific partners like Mercator Ocean. This assessment highlighted that climate change impacts on habitats and marine ecosystems are generally more significant than those caused by hydrographic alterations from new structures.

Recommended Measures and Actions to Maintain/Achieve GES for CI15:

- ✓ **Establishment of National IMAP Monitoring Programmes:** collect statistically significant data for local scale models, Map habitats impacted by hydrographic alterations, link EO7 to EO1 and EO6.
- ✓ **Creation of a Digital Spatial Database:** compile data, on location of interventions, existing and planned structures, and marine habitats, Utilize resources like Copernicus Marine Services, EMODnet, and spatial planning information systems of individual countries to provide necessary data.
- ✓ **Simplification of Indicator Factsheet:** consider revising the existing indicator Factsheet to simplify the reporting method.
- ✓ **Incorporation of Climate Change Indicators:** propose a set of climate change-related indicators within IMAP, including monitoring hydrographic parameters and in-situ data, utilize hydrographic parameters reported within EO5 such as remote sensing.

Ecological Objective 8 (EO8): Coastal ecosystems and Landscapes	
Common Indicator 16:	Length of coastline subject to physical disturbance due to the influence of human-made structures
Candidate Common Indicator 25:	Land cover change

Common Indicator 16:

Key findings

55. Monitoring data for CI16 covered 57% of the Mediterranean coastline (31,283 km). Of this, 26,658 km (85.2%) is natural, and 4,625 km (14.8%) is artificial.

56. Data shows that most human-made structures are ports and marinas.

57. Assessment of changes in physical disturbance is limited due to the lack of comparative data, as only three countries provided two sets of data.

Figure 8: Overview map of the baseline situation for CI 16 (artificial and natural coastline and artificial structures).

Recommended Measures and Actions for GES Achievement:

- ✓ **Ensure consistent detail and spatial resolution in monitoring:** standardized cartographic projections, Analyze and categorize existing artificial coastlines, Improve environmental impact monitoring, harmonize mapping methods across countries.
- ✓ **Define country-specific GES:** unique national circumstances, Promote nature-based solutions and restrict land-take for second homes.
- ✓ **Develop Indicators of Success/ measurable changes in coastline:** e.g. km of restored natural coastline, km of recovered habitats, percentage of nature-based solutions, etc.

Candidate Common Indicator 25:

Key findings

58. A pilot study in the Adriatic sub-region showed built-up areas occupy 8.77% (2,500 km²) of the coastal zone. From 2012-2018, built-up areas increased by 27 km², indicating a land take trend of 1%. The land cover changed from forests, water bodies, and agricultural land to built-up areas and wetlands. Country-specific GES has not been defined, impeding the assessment.

Recommended Measures and Actions for GES Achievement:

- ✓ **Develop a technical manual:** understand coastal ecosystems' integrity and diversity.
- ✓ **Define objective GES at sub-regional or country levels:** for better assessment.
- ✓ **Protect and restore threatened coastal ecosystems and habitats:** improve environmental impact monitoring and mitigation in built-up areas, analyze and categorize existing built-up areas for potential reduction or natural restoration promote nature-based solutions in new construction areas, encourage sustainable land use, restrict land-take for second homes, categorize existing built-up areas for potential reduction or natural restoration)

1.4 Underwater Noise

Ecological Objective 11 (EO11): Noise from human activities cause no significant impact on marine and coastal ecosystems

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

59. Sounds underwater arise from a very wide variety of sources, both natural and human-made (anthropogenic). Natural sounds include those generated by a wide range of marine fauna, waves, rain, wind, and seabed movement, while anthropogenic sounds from human activity at sea include shipping and other marine craft, building and installations, sonar and seismic surveys.

Candidate Common Indicator 26:

Key findings

60. For the years 2016, 2017, 2019, 2020, 2021 and for all the 4 cetacean species considered (bottlenose dolphin, fin whale, sperm whale, Cuvier’s beaked whale), all sub regions are below threshold, i.e., less than 10% of the potentially usable habitat area is affected by noise events as calculated following the adapted assessment methodology. For the year 2018 and for all the 4 species considered, 3 sub-regions are below threshold of affected habitat (Adriatic, Central and western Mediterranean Seas).

61. Overall, for the Mediterranean Sea region, the environmental status is probably acceptable based on the present preliminary assessment findings, since the whole Mediterranean seems to comply with the 10% GES/non-GES boundary value of impacted habitat of cetaceans selected for this assessment. This conclusion is also supported by the computation of the simple coverage (i.e., without considering the habitat of cetaceans) of the Mediterranean Sea by impulsive noise events, which are below 10% for all year considered.

Candidate Common Indicator 27:

Key findings

62. Even though detailed quantitative data on continuous noise were not produced for other months than July 2020, with the highest levels of vessel traffic, hence the worst-case scenario. This result was generalized for the entire year 2020. The computation of the extent of exposure resulted in non- GES status for the Western Mediterranean Sea and the Aegean Levantine Sea Sub-regions (> 20% affected habitats), while the status is tolerable (i.e., GES) in the Adriatic Sea and Central Mediterranean Sea Sub- regions.

Recommended Measures and actions required to maintain/achieve GES EO11 (noise):

- ✓ **Improve underwater noise data quality and availability:** contribution to the ACCOBAMS regional register for impulsive noise sources, cooperation mechanism to identify the source of long-distance underwater noise, reporting noise generating military activities, specific assessments for species and their habitats.
- ✓ **Implement International and Regional management measures (e.g. CMS, IMO, Oceans, ACCOBAMS, etc.):** Promote the application of vessel speed reductions, Integrate the issue of anthropogenic noise in management plans in Marine Protected Areas and critical habitat of cetaceans, apply the precautionary approach, consider atypical mass stranding, support NETCCOBAMS.
- ✓ **Best Available noise Technologies s should be applied for marine traffic and seismic air gun surveys:** cavitation, reduced speed, individual vessels management plans, quieting technologies and controlled sound source, voiding sensitive areas and times.

Conclusion

63. The Mediterranean ecosystems are highly vulnerable to coastal urbanization, industrial and agriculture pollution, tourism and trawling disturbances.

64. The Mediterranean Sea's unique biotope, characterized by species such as *Posidonia oceanica* meadows and coralligenous assemblages, is vital through its ecosystem services like food resources, cultural and recreational use and tourism. However, these ecosystems are highly vulnerable to coastal urbanization, industrial and agriculture pollution, tourism, and trawling disturbances. Ecosystems are essential for seafood provision, coastal protection, and carbon sequestration, but human activities and limited knowledge impede achieving Good Environmental Status (GES) in many areas.

65. Despite data limitations, the 2023 assessment highlighted severe pressures from infrastructure development and bottom fishing. The Mediterranean waters host endangered species like the monk seal and various cetaceans, with human activities posing significant threats. Data quality issues hinder comprehensive GES assessments for these species. Non-indigenous species (NIS) are a growing concern, with over 1,199 new NIS reported during the five last decades. Monitoring efforts have increased, but the constant introduction rate complicates trend interpretation. Commercial fish stocks in the Mediterranean are overfished, impacting livelihoods and the economy.

66. Eutrophication, caused by nutrient enrichment, disrupts water ecosystems and poses economic threats. Due to data heterogeneity, complete GES assessment was limited. Chemical pollution persists despite prevention efforts, with varying progress across sub regions. Marine litter, primarily plastics, exert several pressures to the marine ecosystem and associated services for marine life and human health. Monitoring shows high litter levels, with most seafloor stations not achieving GES.

67. Hydrographic alterations impact marine habitats, with countries facing monitoring challenges. Climate change has greater impacts than new structures. Noise pollution affects cetacean habitats, with varying GES status across sub regions.

68. Overall, addressing these environmental challenges requires coordinated efforts, enhanced monitoring, data sharing, and implementing effective management and conservation strategies to protect and sustain the Mediterranean marine ecosystem.

69. Efforts to protect the Mediterranean's biodiversity, combat pollution, manage non-indigenous species, and ensure sustainable use of resources must be intensified through enhanced monitoring, data collection, and coordinated policy implementation. Strengthening science-policy interfaces and utilizing advanced technologies are essential for achieving Good Environmental Status and preserving the region's marine environment.

Useful Links:

- 2023 Mediterranean Quality Status Report (2023 MED QSR)
- Executive Summary of the 2023 MED QSR (Decision IG.26/3 – COP22)

UNITED NATIONS

EP

UNEP/MED WG.630/L.2

15 September 2025
Original: English

12th Meeting of the Ecosystem Approach Coordination Group

Athens, Greece, 15 September 2025

Note by the Secretariat

The Annex to the present note sets out the Conclusions and Recommendations of the 12th Meeting of the Ecosystem Approach (EcAp) Coordination Group, 15 September 2025, as adopted by the Meeting

UNEP/MAP
Athens, 2025

Annex

Conclusions and Recommendations of the 12th Meeting of the Ecosystem Approach Coordination Group

The 12th Meeting of the Ecosystem Approach Coordination Group (EcAp CG) was held in Athens, Greece, on 15 September 2025. The Meeting was organized by UNEP/MAP Secretariat.

Further to its deliberations, the Meeting reviewed all agenda items as indicated in the Annotated Agenda and reached the following conclusions:

Agenda Item 3: Ecosystem Approach (EcAp) Policy and Roadmap for the Mediterranean 2026-2035

Agenda Item 5: Main Elements of the Draft Decision on the Ecosystem Approach to COP24

1. The Meeting reviewed Working Document UNEP/MED WG.630/3 *"Ecosystem Approach (EcAp) Policy and Roadmap for the Mediterranean (2026-2035)"*, and endorsed it as amended and presented in Appendix 1of the present document that includes the:

    a) EcAp Policy and Roadmap for the Mediterranean Sea (2025–2035), including the EcAp vision for achieving Good Environmental Status (GES) and 6-step approach for the implementation of EcAp Policy in the Mediterranean;
    b) Operational Objectives, Common Indicators, GES Definitions and associated Targets for all IMAP Clusters (i.e. Biodiversity and Non-Indigenous Species, Pollution and Marine Litter, Coast and Hydrography);
    c) Main Scope of Actions;
    d) Timeline for EcAp Roadmap and Policy Implementation; and
    e) Terms of Reference (TORs) for EcAp Correspondence Groups on Monitoring (CORMONs), and Online Working Groups (OWGs), and Flow of Work.

2. The Meeting agreed to include the above listed document (Appendix 1 of these Conclusions and Recommendations) as Annex I to the proposed draft EcAp Decision for the consideration of the Meeting of the MAP Focal Points (Athens, Greece, 16-19 September 2025).

3. The Meeting agreed to upgrade Candidate Indicators 26 and 27 of Ecological Objective 11 to Common Indicators, taking into account specificities of national circumstances, and it recommended the progressive inclusion of these indicators in national IMAPs[1].

4. The Meeting agreed to reclassify Common Indicators 29 to 36 under EO4 (Marine Food Webs) to Candidate Common Indicators, and commits to consider upgrading these indicators in two-years' time to Common Indicators, pending increased scientific knowledge, data availability and clarified assessment methodologies, towards establishing respective GES Definitions and Targets. In this respect, the meeting encouraged the Contracting Parties to continue, where appropriate, monitoring and data collection with support from the Secretariat to allow further progress in the work of the respective CORMONs with regards to respective candidate common indicators.

5. Considering the momentum with regard to climate change and the agreement, in principle, of the 12th Meeting of the EcAp Coordination Group that the new IMAP should consider climate change, and the ongoing work of PAP/RAC on coastal degradation (EO7 and EO8), the meeting agreed to recommend to the Meeting of the MAP Focal Points (Athens, Greece, 16-19 September 2025) the possibility to receive a proposal from the CORMON Coast and Hydrography meeting (online) by the end of September 2025 to address the following:

[1] Study reservation by Egypt

a) The possibility to activate indicators 7.1.1 and 7.1.2 already proposed under UNEP/MED WG.630/3 (Appendix 1); and
b) The possibility for the inclusion of 1 to 3 indicators under EO8, considering that these indicators are measurable and that the methodology is clear, based on the ongoing discussion held under CORMON Coast and Hydrography

6. The Meeting recommended the EcAp Coordination Group members, pending approval by the Meeting of the MAP Focal Points (Athens, Greece, 16-19 September 2025), the proposed course of action, as provided for in para 5, to coordinate at national level to ensure that the CORMON Coast and Hydrography can make proposals, as appropriate, for consideration by COP 24, through the Secretariat in line with the Rules of Procedure for the submission of the working documents to COP24

7. The Meeting requested the Secretariat to give particular attention in supporting the Contracting Parties, for the 3rd Cycle of IMAP implementation, with a particular focus on newly introduced Common and Candidate Indicators,

8. The Meeting reviewed and endorsed Working Document UNEP/MED WG.630/4, *"Integrated Monitoring and Assessment Programme for the Mediterranean Sea and Coast and Related Assessment Criteria (IMAP) (Third Cycle)"* as amended, (Appendix 2 to the present document) included as Annex II of the proposed draft EcAp decision for consideration of the Meeting of the MAP Focal Points (Athens, Greece, 16-19 September 2025).

9. The Meeting also took note of the need for more active involvement of national experts in the implementation of IMAP, in particular regarding regional and subregional assessment.

10. The Meeting reviewed Working Documents UNEP/MED WG. 630/10 "*Updated Reference List of Species and Habitats, Assessment Criteria and Scales, Threshold Values, and Baseline Values for Biodiversity and Non-Indigenous Species*" and approved its integration into Annex II of the Draft Decision on the EcAp Policy and Roadmap 2026–2035 in Annex II and submission to the Meeting of the MAP Focal Points (Athens, Greece, 16-19 September 2025), for its consideration.

11. The Meeting reviewed the Working Document UNEP/MED WG.630/5 "Elements for a Draft Decision" as well as the CRP prepared by the Secretariat as a draft decision on Ecosystem Approach for submission to the Meeting of the MAP Focal Points (Athens, Greece, 16-19 September 2025), for its consideration as amended.

12. The Meeting reviewed Working Documents UNEP/MED WG. 630/6, UNEP/MED.WG. 630/7, UNEP/MED. WG. 630/8, UNEP/MED. WG. 630/9 on guidance fact sheets for IMAP common indicators 13, 14, 15, 16, 17, 18, 20, 21, 25, 26 and 27 (Appendices 3 to 8 of the present document) and approved them for their implementation by the Contracting Parties with support of the UNEP/MAP and its components.

13. The meeting thanked the Secretariat for all efforts made to mobilise resources for the Contracting Parties to support the implementation of National IMAP, programmes of measures/ NAPs, and requested the Secretariat to ensure that adequate resources are available for the Contracting Parties in this respect in the future.

Agenda Item 6: Any Other Business

14. The Meeting welcomed the presentation delivered by European Commission on recently adopted Ocean Pact, Water Resilience Strategy, and review and update of the MSFD evaluation and the upcoming Pact for the Mediterranean, and acknowledge the importance for further enhancing relevant synergies.

Appendix 1

Ecosystem Approach (EcAp) Policy and Roadmap for the Mediterranean (2026-2035)

Table of Contents

1. Introduction

1. The Ecosystem Approach (EcAp) was agreed in the framework of UNEP/MAP Barcelona Convention System in 2008 and since then a number of important Decisions have been adopted by the Contracting Parties (CPs) to the Barcelona Convention to support the roadmap for its implementation:

- 2008 – COP15 | Decision IG.17/6: "Implementation of the Ecosystem Approach to the management of human activities that may affect the Mediterranean marine and coastal environment".
- 2012 – COP17 | Decision IG.20/4: *"Implementing MAP ecosystem approach roadmap (Mediterranean Ecological and Operational Objectives, Indicators and Timetable for Implementing the Ecosystem Approach Roadmap"*.
- 2013 – COP18 | Decision IG.21/3: *"Ecosystem Approach including adopting definitions of Good Environmental Status (GES) and Targets"*.
- 2017 – COP20 | Decision IG.23/6: *"2017 Mediterranean Quality Status Report (MED QSR)"*.
- 2019 – COP21 | Decision IG.24/4: *"Assessment Studies"* (Annex V: Roadmap and Needs Assessment for the 2023 MED QSR)
- 2021 – COP22 | Decision IG.25/3: *"Governance"* (Annex I: Governance Mechanism for the Implementation of the Ecosystem Approach in the Mediterranean).
- 2021 – COP22 | Decision IG.25/10: *"MAP Data Policy"*.
- 2023 – COP23 | Decision IG.26/3: *"The 2023 Mediterranean Quality Status Report (MED QSR) and a Renewed Ecosystem Approach Policy in the Mediterranean"*.

2. Ecosystem Approach Vision for Achieving Good Environmental Status in the Mediterranean Sea (2025–2035)

2. The Mediterranean Sea is one of the most iconic marine environments. It is home to approximately 17,000 marine species, some of which are found nowhere else, and supports the livelihoods of over 480 million people living in its coastal states. However, this vital resource stands at a crossroads with pressures from climate change, pollution, overfishing, invasive species, unsustainable tourism, and habitat degradation are mounting, placing the ecological and socio-economic future of the region at serious risk.

3. Drawing from the main findings deriving from UNEP/MAP Barcelona Convention Ecosystem Approach (EcAp) policy implementation, the 2023 Mediterranean Quality Status Report (MED QSR) and its Summary for Policy Makers, as well as inputs from the 2025 Marine Strategy Framework Directive (MSFD) Evaluation and its assessment of Programmes of Measures (PoMs) in the Mediterranean Sea, this roadmap outlines strategic vision for achieving Good Environmental Status (GES) across the Mediterranean basin by 2035.

4. Building on the significant achievements in implementing the Ecosystem Approach (EcAp) since its launch in 2008, there is a growing need to place greater emphasis on the use of innovative approaches and tools - such as the Source-to-Sea Management, Marine Spatial Planning, Nature-Based Solutions, Ocean Ecosystem Accounting, Mapping of Coastal and Marine Ecosystems, and the Compendium for Coast and Sea – to enhance the protection, conservation and restoration of coastal ecosystems; integrated coastal zone and ocean management; climate mitigation and adaptation; disaster risk reduction. This highlights the urgent need to build the resilience of coastal and marine ecosystems and to better inform policy - making, development planning, and conservation efforts, thereby accelerating progress towards achieving GES and contributing to implementation of the ocean related SDGs by 2030. It is also essential to strengthen scientific knowledge on deep sea ecosystems.

5. These efforts contribute to strengthening synergies with the implementation of UNEA and its ocean-related resolutions, relevant IMO conventions, the EU Marine Strategy Framework Directive (MSFD), Regional Sea Conventions, and relevant Multilateral Environmental Agreements (MEAs). By advancing the integrated and ecosystem-based approach, the Mediterranean region has the potential to become a model for sustainable marine management - supporting climate resilience and the restoration of ocean health.

2.1 Current Status and Challenges

Achievements to Date:

6. Over the past decade, significant progress has been made under regional and national initiatives aimed at restoring marine ecosystems and improving the health of the Mediterranean Sea and Coast. The Integrated Monitoring and Assessment Programme (IMAP) has strengthened surveillance across biodiversity, pollution – marine litter, and ecosystem health indicators. Regional and national programmes of measures, and several actions on the ground, have been adopted and implemented aiming at achieving Good Environmental Status. It should also be noted that the Mediterranean already hosts many inspiring initiatives proving that ecosystem-based management and sustainable marine governance are both feasible and impactful. These experiences offer valuable lessons for scaling up efforts across the region.

Persistent and Emerging Challenges:

7. Despite achievements, challenges persist and are intensifying, and the Mediterranean Sea remains on the way of achieving GES. Some indicators of biodiversity and pollution show positive trends, while others - notably the status of fish stocks, coastal habitats, and non-indigenous species — are deteriorating or showing insufficient progress:

a) Biodiversity loss continues to be a pressing issue. MPAs currently cover only around 9% of the Mediterranean — well below the 30% target — and many existing MPAs suffer from inadequate management effectiveness. The populations of endangered species such as the loggerhead turtle (*Caretta caretta*) and the Mediterranean monk seal (*Monachus monachus*) remain vulnerable. Invasive species like the lionfish (*Pterois miles*) and blue crab (*Callinectes sapidus*) have expanded their range, disrupted native ecosystems and caused economic damage to fisheries. The 2023 MED QSR indicates that the number of established non-indigenous species has doubled since 2012, highlighting the accelerating pressure of biological invasions.

b) While a complete 2023 MED QSR GES assessment for eutrophication across all sub-regions was not possible, the impacts of eutrophication—primarily driven by agricultural runoff, untreated urban wastewater, and coastal aquaculture— do not appear to be increasing. Instead, they remain mainly confined to areas historically affected by eutrophication. Harmful algal blooms have been recorded with increasing frequency, disrupting fisheries, aquaculture, and tourism.

c) Despite progress in pollution prevention at source, pressures on the Mediterranean Sea persist. Using various assessment methodologies - harmonized to the extent possible — several areas were identified as not achieving Good Environmental Status (GES). Nevertheless, the overall condition of the assessed zones across all four sub-regions generally remains moderate to good. The situation is more concerning with regard to acute pollution events (e.g., slicks from oil, oil products, and hazardous substances), which have a significant impact on biota. These events contribute to some sub-divisions showing even poor to bad conditions.

d) Marine litter remains pervasive. Hundreds of tonnes of plastic daily entering the Mediterranean Sea, primarily from major urban centres, other densely populated areas, river discharges and fishing activities. Hotspots of plastic accumulation exemplify the growing magnitude of this issue, and according to the 2023 MED QSR densities remain high, while progress in reducing marine litter inputs remains slow.

e) The circulation of the Mediterranean Sea is driven by a combination of external forces—such as wind stress and strong topographic constraints—as well as internal dynamic processes. These forces operate across three predominant and interacting spatial scales: basin scale, sub-basin scale, and mesoscale. Compared to the hydrographic alterations caused by new structures, climate change appears to have a significantly greater impact on habitats and marine ecosystems overall.

f) Climate change poses a growing existential threat. The Mediterranean Sea is warming at a rate 20% faster than the global average, leading to shifts in species distribution, mass mortality events of benthic organisms, and the degradation of critical habitats like Posidonia oceanica seagrass beds. Ocean acidification, sea-level rise, and increasing extreme weather events compound these impacts, undermining the resilience of marine and coastal ecosystems. The rise in seawater temperature is accelerating the spread of non-indigenous species. Hydrographic changes cause Mediterranean marine habitats to be increasingly endangered, with some at risk of complete extinction. The central and eastern Mediterranean areas are considered more vulnerable to climate change due to increased pressure from invasive species, higher water temperatures and less ocean circulation, which leads to lower levels of dissolved oxygen.

Risks:

a) Enhanced governance faces ongoing challenges, including fragmented cooperation, policy incoherence across sectors (e.g., tourism, agriculture, energy), inconsistencies in monitoring and reporting, and challenging enforcement mechanisms, unequal efforts to achieve GES and the ocean related SDGs targets. Inadequate financial and human resources. Political instability, financial constraints, worsening climate and environmental measures that are perceived as unfair, top-down, or economically harmful, local resistance may also undermine implementation.

Opportunities:

Accelerating progress towards achieving Good Environmental Status (GES) by 2035 is an ambitious endeavour also rich in transformative and major opportunities:

a) Green Transition Funding create financial opportunities to align economic recovery with marine conservation. Technological Innovation - such as a Satellite remote sensing, AI-based marine monitoring, autonomous underwater vehicles, and blockchain-based fisheries certification - offer powerful new complementary tools to enhance conventional monitoring and assessment procedures, while also contributing to improved enforcement and transparency. Youth Engagement and broader public awareness provide a critical social foundation for long-term stewardship and political support. Finally, sustainable aquaculture, renewable marine energy, eco-tourism, and marine biotechnology can drive Blue Economy Growth and sustainable livelihoods if properly managed.
b) Securing financial resources for marine protection presents both a challenge and an opportunity for innovation and regional cooperation. Public funding — particularly from national budgets —remains essential alongside considerable EU funding instruments applicable across the Mediterranean region, and international environmental financing mechanisms such as the Global Environment Facility (GEF), Green Climate Fund (GCF), Adaptation Fund, and Climate Investment Funds (CIF). Additional support through voluntary contributions from Contracting Parties, bilateral donors` funding arrangements, philanthropic foundations, and private sector investments also plays a crucial role. To be effective, Financing must be predictable, sustainable, and readily accessible, particularly for developing Mediterranean countries.
c) Innovative solutions are needed, such as expanding regional trust funds like MedFund, establishing national conservation funds (e.g., Tunisia’s Blue Fund), and issuing blue bonds to fund restoration and pollution control. Payment for Ecosystem Services (PES) schemes should also be promoted, and private sector engagement must be strengthened through investment pipelines, risk mitigation, and performance standards to drive sustainable marine investments.

8. Successfully navigating these risks while leveraging these opportunities requires adaptive, inclusive, evidence-based, and transparent governance frameworks.

2.2 A Vision for 2035

9. The vision for the Mediterranean by 2035 is clear: a clean, healthy, resilient, and biodiverse marine ecosystem that supports sustainable livelihoods and socio-economic development. Under the Ecosystem Approach (EcAp) Policy and Roadmap for the Mediterranean (2026-2035), this vision is further reinforced.

10. This vision ensures alignment with the Mediterranean Strategy for Sustainable Development (2026-2035), and the 2030 Agenda for Sustainable Development.

11. Achieving GES will require a fundamental shift: not merely slowing degradation, but actively restoring marine ecosystems and addressing systemic socio-economic drivers of change. The vision must therefore encompass ecological restoration, climate adaptation, considerable pollution reduction , biodiversity protection, and sustainable use of marine resources.

12. Achieving this vision requires a systemic transformation that integrates scientific evidence, traditional knowledge, community engagement, sustainable investment, and bold political leadership. It demands that all sectors – from fisheries and tourism to energy and transport – transition toward sustainability and resilience, with effective enforcement mechanisms, cross-sectoral integration, and transparent reporting frameworks.

3. The Step Approach for the Implementation of EcAp Policy in the Mediterranean

13. The following six (6) steps are proposed to support the implementation of EcAp Policy and Roadmap in the Mediterranean for the upcoming period 2026 to 2035:

Step I:	Definition of an Ecological Vision for the Mediterranean.
Step II:	Setting Common Mediterranean Strategic Goals.
Step III:	Development of a Set of Ecological Objectives and Common Indicators with GES Definitions and Targets corresponding to the Vision and Strategic Goals.
Step IV:	Implementation of National IMAP[1]-based Monitoring Programmes for ongoing Assessment and regular updating of Targets.
Step V:	Preparation and Issuance of the Mediterranean Quality Status Report (MED QSR)
Step VI:	Development and Review of relevant National Action Plans (NAPs) and/or Programmes of Measures (PoMs)

Step I: Definition of an Ecological Vision for the Mediterranean

14. The following Ecological Vision is proposed, in line with the vision of the UNEP/MAP Mid-Term Strategy (MTS) 2022-2027 (Decision IG.25/1):

"Progress towards a healthy, clean, ~~[~~pollution free[2]~~]~~ sustainable and climate resilient Mediterranean Sea and Coast with productive and biologically diverse marine and coastal ecosystems, where the 2030 Agenda for sustainable development and its Sustainable Development Goals (SDGs) are achieved through the effective implementation of the Barcelona Convention, its Protocols and the Mediterranean Strategy for Sustainable Development for the benefit of people and nature."

[1] Integrated Monitoring and Assessment Programme for the Mediterranean Sea and Coast
~~[2] Proposal from Egypt~~

Step II: Setting Common Mediterranean Strategic Goals

15. The following Strategic Goals are expected to support and enhance the implementation of EcAp Policy and Roadmap in the Mediterranean for the period 2026 to 2035:

a) To protect, enhance environmental conditions allowing natural recovery and, where practicable ~~[~~based on national priorities~~]~~[3], restore the structure and function of marine and coastal ecosystems thus also protecting biodiversity, in order to achieve and maintain Good Environmental Status and allow for their sustainable use.
b) To reduce pollution in the marine and coastal environment so as to minimize impacts on and risks to human and/or ecosystem health and/or uses of the sea and the coasts ~~[~~and reduce the pollution from different sources~~]~~[4].
c) To prevent, reduce and manage the vulnerability of the sea and the coasts to risks induced by human activities, including climate change and natural events.

Step III: Development of a Set of Ecological Objectives and Common Indicators with GES Definitions and Targets corresponding to the Vision and Strategic Goals.

16. A set of 11 Ecological Objectives (EOs) and related Common and/or Candidate Indicators, including GES Definitions and Targets are in place in the framework of EcAp Policy Implementation and related Integrated Monitoring and Assessment Programme (IMAP) for the Mediterranean Sea and Coast, as detailed in Appendix 1.

Step IV: Implementation of National IMAP-based Monitoring Programmes for ongoing Assessment and regular updating of Targets.

17. Since 2016 national IMAP-based monitoring programmes have been developed and are operational in line with the regional IMAP and its respective Ecological Objectives and Common Indicators. They are expected to be updated till 2026 to streamline the updated IMAP to be approved by COP 24 (Cairo, Egypt, 2-5 December 2025).

Step V: Preparation and Issuance of the Mediterranean Quality Status Report (MED QSR)

18. The Mediterranean Quality Status Report (MED QSR) series builds on a robust conceptual foundation and nationally sourced, quality-assured data submitted by the Contracting Parties to the Barcelona Convention through IMAP InfoSystem or other reliable sources, to provide an evidence-based reliable assessment of Good Environmental Status (GES) of the Mediterranean Sea and coast, based on a GES /non-GES approach, as defined in the framework of the ecosystem approach and related Integrated Monitoring and Assessment Programme IMAP.

19. The preparation of the MED QSRs has seen coordinated efforts on data acquisition covering a series of Ecological Objectives and related Common Indicators of IMAP. A noteworthy fact about the MED QSRs is the way they embody the scale-shifting endeavors that is required for effective environmental assessment. The reports blend national data with patterns observed at the regional level. By distilling new knowledge, the report also contributes to other relevant assessment exercises at global, regional and national levels, and the implementation of respective policies and regulatory framework.

20. To date, two (2) different iterations of MED QSR have been issued in 2017 (Decision IG.23/6 of COP 20) and 2023 (Decision IG.26/3 of COP 23), whereas this series of reports is planned to be issued following a six (6) year data generation and assessment cycle followed by a 2-year period for document preparation and review through the respective UNEP/MAP governing bodies.

[3] ~~Proposal from Egypt~~
[4] ~~Proposal from Egypt~~

Step VI: Development and Review of relevant National Action Plans (NAPs) and/or Programmes of Measures (PoMs)

21. National Action Plans (NAPs) and/or Programmes of Measures (PoMs) have been developed since 2016 for all Contacting Parties to the Barcelona Convention (Decision IG.22/8 of COP 19) and were updated in 2025.

22. A number of important and targeted legally-binding measures with timelines have been adopted in the Mediterranean since 2013 in the framework of the six (6) legally-binding Regional Plans and of the Post-2020 SAPBIO were adopted for the Mediterranean since 2013, as detailed in Appendix 3:

- Regional Plans on Urban Wastewater Treatment and Sewage Sludge Management in the Framework of Article 15 of the Land Based Sources Protocol (Decision IG.25/8)Regional Plan on Stormwater Management in the framework of Article 15 of the Land-Based Sources and Activities Protocol (LBS Protocol) (Decision IG.26/8)
- Amendments to the Regional Plan on Marine Litter Management in the Mediterranean in the Framework of Article 15 of the Land Based Sources Protocol (Decision IG.25/9)
- Regional Plan on Agriculture Management in the framework of Article 15 of the Land-Based Sources and Activities Protocol (Decision IG.26/6)
- Regional Plan on Aquaculture Management in the framework of Article 15 of the Land-Based Sources and Activities Protocol (Decision IG.26/7)
- Post-2020 Strategic Action Programme for the Conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region (Post-2020 SAPBIO) (Decision IG.25/11)

3.1 Timeline for Implementing Ecosystem Approach Policy and Roadmap

23. A timeline extended from 2026 to 2035, including projected outputs and key milestones of EcAp Policy and Roadmap implementation is presented in Appendix 2.

3.2 Governance Mechanism for the Implementation of the Ecosystem Approach in the Mediterranean

24. A governance mechanism has been set in place since 2021 to support the implementation of the EcAp in the Mediterranean (Decision IG.25/03).

25. The Ecosystem Approach Coordination Group (EcAp CG), consisting of MAP Focal Points, has a key role in providing guidance and supervising EcAp implementation:

a) On the delivery of the EcAp, making sure that all elements for its implementation are taken into account, weighting of priorities and resource implications; and
b) In coordinating Barcelona Convention-UNEP/MAP's facilitation role, in support of Contracting Parties in their implementation of EcAp.

26. Two types of Correspondence Groups are formed in the process of application of EcAp in the Mediterranean and to support EcAp Coordination Group:

a) The Correspondence Group on Monitoring (CORMON) composed of national experts designated by the Contracting Parties and coordinated by Barcelona Convention-UNEP/MAP Coordinating Unit and respectively MED POL, SPA/RAC and PAP/RAC (depending on the IMAP cluster), working to ensure efficient coverage and in-depth discussions and analysis regarding integrated monitoring and assessment.
b) The Correspondence Group on Economic and Social Analysis (COR ESA) is composed of national experts designated by the Contracting Parties and invited experts and coordinated by Barcelona Convention-UNEP/MAP Coordinating Unit and PlanBleu/RAC. It develops a socioeconomic analysis of marine ecosystems uses, focusing on priority sectors such as fisheries, aquaculture, maritime transport, recreational activities, and oil industry and offshore and address as appropriate the

socioeconomic aspects related to the formulation and implementation of programmes of measures to achieve/maintain Good Environmental Status (GES)

27. Informal Online Working Groups (OWG) are composed of experts and scientists nominated by the Contracting Parties and experts mobilized by the Secretariat and respective MAP Components. The composition should be restricted in number, with well-balanced geographical representation. The agenda of the Informal OWG and the timeline for their operationality is defined by the respective CORMONs. The Informal OWG report to CORMON and do not replace CORMONs.

28. 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. To this aim, the EcAp CG may decide on terms of references including potential list/type of documents for the technical bodies also addressing the need for the effective interaction among different bodies.

29. For Science-Policy Interface (SPI), effort should be made to promote SPI for IMAP implementation in the Mediterranean.

30. The “Terms of Reference for the CORMONs, CORESA and Online Working Groups and Flow of Interaction between Ecosystem Approach and MAP Governing Bodies” are detailed and presented in Appendices 4 and 5 to the present document.

Appendix 1: List of Ecological Objectives, Common Indicators, GES Definitions and Proposed Targets

Ecological Objective 1 (EO1):	Biological diversity is maintained or enhanced. The quality and occurrence of coastal and marine habitats and the distribution and abundance of coastal and marine species are in line with prevailing physiographic, hydrographic, geographic and climatic conditions		
Operational Objective	Indicator	GES Definition	GES Targets
1.1 Key coastal and marine habitats are not being lost (Benthic and Pelagic Habitats[5])	1.1.1 Habitat distributional range (Common Indicator 1)	The habitat is present in all its natural distributional range.	State: • The ratio Natural / observed distributional range tends to 1 Pressure • Decrease in the main human causes of the habitat decline
	1.1.2 Condition of the habitat- defining species and communities (Benthic Habitats) (Common Indicator 2)	The population size and density of the habitat-defining species, and species composition of the community, are within reference conditions ensuring the long-term maintenance of the Habitat	State: • No human induced significant deviation of population abundance and density from reference conditions. • The species composition shows a positive trend towards reference condition over an increasing proportion of the habitat (for recovering habitats)
	1.1.3 Condition of the habitat- defining species and communities (Pelagic Habitats[6]) (Common Indicator 2)	(under development)	(under development)

[5] The habitat type, including its biotic and abiotic structure and its functions, is not adversely affected due to anthropogenic pressures (e.g. typical species composition and their relative abundance, absence of particularly sensitive or fragile species or species providing a key function, size structure of species). Pelagic broad habitat types (variable salinity, coastal, shelf and oceanic/beyond shelf), if present in the region or subregion: 1. other habitat types could be defined by MS for the MSFD; 2. The typology of pelagic habitats represents a general framework that can be adapted and modified by CPs to integrate local ecosystems features and dynamics

[6] Phytoplankton and zooplankton abundance, biomass, communities' composition, functional groups provide good means to identify changes in key groups at the plankton community level. On the other hand, GES and Targets will be discussed during the next WG meetings for a proposal for CORMON Biodiversity and Fisheries. Proposal of indicators was reviewed and endorsed during the COMON Biodiversity and Fisheries meeting held in Athens, Greece (7–8 April 2025), as well as at the 17th Meeting of the SPA/BD Focal Points (Istanbul, Türkiye, 20–22 May 2025).

1.2 Species distribution is maintained (marine mammals, birds, reptiles)	1.2.1 Distributional range (marine mammals) (Common Indicator 3)	Cetaceans: The species are present in all their natural distributional range. Monk Seal: Monk Seal is present along recorded Mediterranean coasts with suitable habitats for the species.	State: • Cetaceans: The distribution of cetaceans remains stable or expanding and the species that experienced reduced distribution in the past are in favorable status of conservation and can recolonize areas with suitable habitats. • Monk Seal: The distribution of Monk Seal remains stable or expanding and the species is recolonizing areas with suitable habitats. Pressure/Response: • Human activities having the potential to exclude marine mammals from their natural habitat within their range area or to damage their habitat are regulated and controlled. • Conservation measures implemented for the zones of importance for cetaceans. • Fisheries management measures that strongly mitigate the risk of incidental taking of monk seals and cetaceans during fishing operations are implemented.
	1.2.2 Distributional range (birds) (Common Indicator 3)	The species continues to occur in all their Mediterranean natural habitat.	State: • No significant reduction in the population distributional range in the Mediterranean in all indicator species which are listed as least-concerned (LC); No significant reduction[7] in the population distributional range in the Mediterranean in all indicator species which are currently listed with conservation concern. • New colonies are established, and the population is encouraged to spread among several alternative breeding sites, especially for species with conservation concern.
	1.2.3 Distributional range (reptiles) (Common Indicator 3)	The species continues to occur in all its natural range in the Mediterranean, including nesting, mating, feeding and wintering and developmental (where different to those of adults) sites	State: • Turtle distribution is not significantly affected by human activities • Turtles continue to nest in all known nesting sites Pressure/Response: • Protection of known nesting, mating, foraging, wintering and developmental turtle sites. • Human activities having the potential to exclude marine turtles from their range area are regulated and controlled. • The potential impact of climate change is assessed

[7] Comment received from Malta during the 11th Meeting of Ecosystem Approach Coordination Group (EcAp CG): With regards to indicator 1.2.2 – Malta questions the applicability of ‘significant increase’ to all species under consideration, particularly to species which might be characterized by localized distribution associated with available habitat types. We would thus recommend keeping the original text ‘No significant reduction in the population’.

1.3 Population size of selected species is maintained (marine mammals, birds, reptiles)	1.3.1 Population abundance (marine mammals) (Common Indicator 4)	Cetaceans: The species population has abundance levels allowing to qualify to Least Concern Category of IUCN.	State: • No human-induced mortality is causing a decrease in-breeding population size or density. • Populations recover towards natural levels.
		Monk Seal: Number of individuals by colony allows to achieve and maintain a favorable conservation status.[8]	State: • Continual recovery of population density
	1.3.2 Population abundance (birds) (Common Indicator 4)	The species population has abundance levels allowing qualifying to Least Concern Category of the IUCN Red List or has abundance levels that are improving and moving away from the more critical IUCN category.	State: • No human induced decrease in population abundance. Population recovers towards natural levels where depleted. • The total number of individuals is sparse enough in different spots.
	1.3.3 Population abundance (reptiles) (Common Indicator 4)	The population size allows to achieve and maintain a favorable conservation status taking into account all life stages of the population.	State: • No human induced decrease in population abundance • Population recovers towards natural levels where depleted
1.4 Population condition of selected species is maintained (marine mammals, birds, reptiles)	1.4.1 Population demographic characteristics (e.g. body size or age class structure, sex ratio, fecundity rates, survival/ mortality rates) (marine mammals) (Common Indicator 5)	Cetaceans: preliminary assessment of incidental catch, prey depletion and other human induced mortality followed by implementation of appropriate measures to mitigate these threats Monk Seal: decreasing trends in human induced mortality (e.g., direct killings, pupping/resting habitat /disturbance/occupation)	State: • Decreasing trends in human induced mortality Pressure/Response: • Cetaceans: Appropriate measure implemented to mitigate incidental catch, prey depletion and other human induced mortality • Monk Seal: Appropriate measures implemented to mitigate direct killing and incidental catches and to preclude habitat destruction.

	1.4.2 Population demographic characteristics (e.g. body size or age class structure, sex ratio, fecundity rates, survival/ mortality rates) (birds) (Common Indicator 5)	Species populations are in good conditions: Natural levels of breeding success & acceptable levels of survival of young and adult birds.	State: • Populations of all taxa, particularly those with IUCN threatened status are maintained in long-term following the indication of population models. Pressure/Response: • Incidental catch mortality and other anthropogenic pressures are at negligible levels, particularly for species of conservation concern
	1.4.3 Population demographic characteristics (e.g. body size or age class structure, sex ratio, fecundity rates, survival/mortality rates) (reptiles) (Common Indicator 5)	Low mortality induced by incidental catch. Favorable sex ratio and no decline in hatching rates.	Response: • Measures to mitigate incidental catches in turtles implemented

Ecological Objective 2 (EO2): Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystem			
Operational Objective	Indicator	GES Definition	GES Targets
2.1 Invasive non-indigenous species introductions are minimized	2.1.1 Trends in abundance, temporal occurrence, and spatial distribution of non-indigenous species (NIS) particularly invasive, non-indigenous species notably in risk areas (EO2, in relation to the main vectors and pathways of spreading of such species) (Common Indicator 6)	Decreasing abundance of introduced NIS in risk areas	State: • Abundance of NIS introduced by human activities reduced to levels giving no detectable impact.

Ecological Objective 3 (EO3)[9]:	Populations of selected commercially exploited fish and shellfish are within biologically safe limits, exhibiting a population age and size distribution that is indicative of a healthy stock		
Operational Objective	Indicator	GES Definition	GES Targets
3.1. The Spawning Stock Biomass is at a level at which reproduction capacity is not impaired	3.1. Spawning Stock Biomass (Common Indicator 7)	Achieving or maintaining good environmental status requires that SSB values are equal to or above SSBMSY, the level capable of producing maximum sustainable yield.	State: • B > Bthr
3.2. Total catch of commercial species does not exceed the Maximum Sustainable Yield (MSY) and the bycatch is reduced.	3.2. Total landing (Common Indicator 8) -	Populations of selected commercially exploited fish and shellfish are within biologically safe limits, exhibiting a population age and size distribution that is indicative of a healthy stock.	State: • Long-Term High Yields • Catch < MSY Pressure: • Reduction of IUU catch • Minimization of discarding and incidental catch of vulnerable species
3.3. Fishing mortality in the stock does not exceed the level that allows MSY (F≤ FMSY).	3.3 Fishing mortality (Common Indicator 9)	Populations of selected commercially exploited fish and shellfish are within biologically safe limits, exhibiting a population age and size distribution that is indicative of a healthy stock	Pressure: • F_{MSY} • F0.1 a proxy of F_{MSY} (more precautionary)
3.4. Fishing effort should be reduced by means of a multi-annual management plan until there is an evidence for stock recovery	3.4 Fishing effort (Common Indicator 10)	Total effort does not exceed the level of effort allowing the Maximum Sustainable Yield (MSY)	(under development)

[9] Regarding EO3 consultations are ongoing with GFCM and hopefully progress is expected to by the 11th EcAp CG Meeting.

3.5. Stable or positive trend in CPUE Declines in CPUE may mean that the fish population cannot support the level of harvesting. Increases in CPUE may mean that a fish stock is recovering and more fishing effort can be applied.	3.5 Catch per unit effort (CPUE) (Common Indicator 11)	Catch per unit effort (CPUE) is an indirect measure of the abundance of target species. Changes in the catch per unit effort are inferred to signify changes to the target species abundance	(under development)
3.6 Populations of selected commercially exploited fish and shellfish are within biologically safe limits, exhibiting a population age and size distribution that is indicative of a healthy stock	3.6 Bycatch of vulnerable and non-target species (EO1 and EO3) (Common Indicator 12)	The abundance / trends of populations of seabirds, marine mammals, sea turtles and sharks key species (selected according to their actual and total dependence on the marine environment, and to their ecological representativeness) is stable or not reducing in a statistically significant way taking into account the natural variability compared to the current situation.	(Work in progress within GFCM) State: Cetaceans: No unsustainable impact at population level. Decreasing trends in human induced mortality. Pressure: Cetaceans: Appropriate measure implemented to mitigate incidental catch, prey depletion and other human induced mortality. Monk seal: Appropriate measures implemented to mitigate direct killing and incidental catches and to preclude habitat destruction.

Ecological Objective 4 (EO4):	Alterations to components of marine food webs caused by resource extraction or human- induced environmental changes do not have long- term adverse effects on food web dynamics and related viability		
Operational Objective	Indicator[10]	GES Definition[11]	GES Targets
4.1 Diversity of ecosystem and dynamics across all trophic groups can ensure long-term biomass-abundance of the species	4.1.1-Biomass or abundance of species/genera/taxa or trophic groups[12] (Candidate Common Indicator 29)	(under development)	(under development)
	4.1.2 Average of Mean Trophic Level of species/genera/taxa or trophic groups from biomass and/or catches (Candidate Common Indicator 30)	(under development)	(under development)
	4.1.3 Biodiversity indices (Candidate Common Indicator 31)	(under development)	(under development)
4.2 Proportion of selected group of species is balanced as in healthy food webs	4.2.1 Pelagic/Demersal ratio (Candidate Common Indicator 32)	(under development)	(under development)
	4.2.2 NIS/Demersal ratio (Candidate Common Indicator 33)	(under development)	(under development)

[10] Biomass (i.e. Kg/km2), abundance (i.e. Number of individuals/km2) and size (i.e. total length of body) of species can be obtained for example for many demersal species from MEDITS data and GFCM stock assessment reporting datasets. B) commercial catches of target species and production of fisheries can be obtained for example by using FAO data (FishstatJ). C) Trophic level of species can be obtained from large dataset such as Fishbase and Lifebase. Indicators belonging to objective 4.1 are useful for a first evaluation of potential anthropogenic impact on the structure of food webs as a whole system by specifically looking at simple data such as biomass or abundance of species groups (indicator 4.1.1), trophodynamics (indicator 4.1.2) and diversity such as alpha and beta indices (indicator 4.1.3). Indicators belonging to operational objective 4.2 focus on some food web compartments to have more specific evidence of potential anthropogenic impacts such as detrimental effect of bottom fisheries and/or eutrophication (indicator 4.2.1), increase of non-indigenous species (indicator 4.2.2), changes in net primary production affecting the base of food webs (indicator 4.2.3 and 4.2.4), depletion of large megafaunal organisms (indicator 4.2.5)

[11] GES and targets will be discussed at the next meetings of the Biodiversity Online Working Group / CORMONs as soon as other progress from EU experience (MSFD, OSPAR, HELCOM) or other pilot assessments allow a proposal to be made.

	4.2.3 Zooplankton/ phytoplankton ratio (Candidate Common Indicator 34)	(under development)	(under development)
	4.2.4 Size distribution of trophic groups (Candidate Common Indicator 35)	(under development)	(under development)
	4.2.5 Production of Megafauna (*Megafauna variables from EO1~~5~~) (Candidate Common Indicator 36)	(under development)	(under development)

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 Definition	GES 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 (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 (Common Indicator 14)	Natural levels of algal biomass, water transparency and oxygen concentrations in line with prevailing physiographic, geographic, and weather conditions	State[13]: • 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 criteria[14]. • Increasing trend of transparency in areas impacted by human activities[15]. • 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 [16]. • Increasing trend in dissolved oxygen concentrations in areas impacted by

[13] Future work should focus on defining high-risk areas, as well as setting reference and boundary values, including GES/non-GES boundary limits, with possible contributions from Online Working Group that may be established for this purpose.
[14] Transferred from Indicator 5.2.2, Decision IG. 21/3, Annex I
[15] ibidem
[16] Transferred from Indicator 5.3.1, Decision IG. 21/3, Annex I. The current revision includes the reinstatement of targets for turbidity, water transparency and dissolved oxygen concentrations, in order to align with the established GES definition for Common Indicator 14 on Chlorophyll-a, as agreed upon in the 2017 MED QSR: “Natural levels of algal biomass, water transparency, and oxygen concentrations in line with prevailing physiographic, geographic, and weather conditions. As originally defined in Decision IG.21/3, the present document reconsiders the original GES definitions which identified turbidity, water transparency and dissolved oxygen as supporting parameters in the assessment of GES based on chlorophyll-a concentrations.

			human activities[17].

[17] ibidem

Ecological Objective 6 (EO6):	Sea-floor integrity is maintained, especially in priority benthic habitats		
Operational Objective	Indicator	GES Definition	GES Targets
6.1 All benthic broad habitat types maintain their natural extent, with limited loss due to anthropogenic pressures	6.1.1 Extent of physical loss of natural habitat (Common Indicator 37)	The extent of loss of each habitat type, resulting from anthropogenic pressures, does not exceed a specified proportion of the natural extent of the habitat type in the assessment area.	Extent of physical loss per habitat type does not exceed [X%] of each habitat's natural extent.
6.2 All benthic broad habitat types maintain their natural structure, functions and biodiversity	6.2.1 Extent of adverse effects on benthic habitat[18] (Common Indicator 38)	The extent of adverse effects from anthropogenic pressures on the condition of each habitat type, including alteration to its biotic and abiotic structure and its functions (e.g., its typical species composition, absence of particularly sensitive or fragile species or species providing a key function, size structure of species; carbon sequestration capacity), does not exceed a specified proportion of the natural extent of the habitat type in the assessment area.	Extent of adverse effects from anthropogenic pressures[19] per habitat type does not exceed [Y%] of each habitat's natural extent.

[18] This may comprise several indicators which address specific pressures
[19] Value Y% for adverse effects includes value X% for physical habitat loss. Value Y% encompasses any loss of biogenic habitat and changes to habitats at EUNIS level 2 that are defined as habitat loss under MSFD (MSFD GD19, 2022, version 12-12-2023) because such losses can be more much extensive than losses due to physical structures.

Ecological Objective 7 (EO7):	Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems.		
Operational Objective	Indicator	GES Definition	GES Targets
7.1 Impacts to the marine and coastal ecosystem induced by climate variability and/or climate change are minimized	7.1.1 Large scale changes in circulation patterns, temperature, pH, and salinity distribution ~~*(not activated)*~~ *Common Indicator 15bis*	Ecosystems are resilient enough to adapt to climate change.	• Anthropogenic impacts which may alter ecosystems' adaptive capacity are reduced.
	7.1.2 Long term changes in sea level ~~*(not activated)*~~*Common Indicator 15ter*		
7.2 Alterations due to permanent constructions on the coast and watersheds, marine installations and seafloor anchored structures are minimized	~~7.2.1 Impact on the circulation caused by the presence of structures *(not activated)*~~	~~With new structures in place, near shore wave- and current patterns maintain as natural as possible.~~	• ~~Marine and shore based new structures planned, constructed and operated in a way to maintain the natural wave and current pattern as much as possible~~
	7.2.2 Location and extent of the habitats potentially impacted by hydrographic alterations[20] (Common Indicator 15)	Negative impacts due to new structure are minimal with no influence on the larger scale coastal and marine system	• Planning of new structures takes into account all possible mitigation measures in order to minimize the impact on coastal and marine ecosystem and its services integrity and cultural/historic assets. Where possible, promote ecosystem health.
~~7.3 Impacts of alterations due to changes in freshwater flow from watersheds, seawater inundation and coastal freatic intrusion, brine input from desalination plants and seawater intake and outlet are minimized~~	~~7.3.3 Changes in key species distribution due to the effects of seawater intake and outlet *(not activated)*~~	~~Water circulation in coastal and marine habitats, and changes in the levels of salinity and temperature are within thresholds, to maintain natural/ecological processes~~	• ~~Site specific tolerable limits of key species in immediate proximity of seawater intake and outlet structures are considered while planning, constructing and operating such infrastructure~~

[20] Current Common Indicator 15 of IMAP.

Ecological Objective 8 (EO8):	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved		
Operational Objective	Indicator	GES Definition	GES Targets
8.1 The natural dynamics nature of coastal areas are maintained, and coastal ecosystems and landscapes are preserved	~~8.1.1 Areal extent of coastal erosion and coastline instability *(not activated)*~~	~~Coastal resilience maintained and improved; and coastal uses made adaptable to coastal erosion.~~	• ~~Impacts of coastal erosion caused by man-made factors anticipated and prevented through coastal erosion management allowing for natural fluctuation of the coast and minimizing coastal erosion risk.~~
	~~8.1.2 Changes in sediment dynamics along the coastline *(not activated)*~~	~~Long term sediment dynamics is within natural patterns.~~	• ~~Disturbance in sediment inflows reduced through improved integrated river basin management and coastal sand management practices.~~
	8.1.4 Length of coastline subject to physical disturbance due to the influence of humanmade structures.[21] (Common Indicator 16)	Physical disturbance to coastal areas induced by human activities should be minimized.	• Negative impacts of human activities on coastal areas are minimized through appropriate management measures
8.2 Integrity and diversity of coastal ecosystems, landscapes and their geomorphology are preserved	8.2.1 Land cover change[22] (Common Indicator 25)	Linear coastal development and low-lying terrain coastal development minimized, with perpendicular development being in balance with integrity and diversity of coastal ecosystems and landscapes. Mixed land-use structure achieved in predominantly man- made coastal landscapes.	Proposed targets should be considered as general recommendations to be adapted to regional/local specificities and knowledge: • No further construction within the setback zone and avoid further construction in low-lying coastal terrain • Change of coastal land use structure, dominance of urban land use reversed • Keep, and increase landscape diversity

[21] Current Common Indicator 16 of IMAP.
[22] Current Candidate Common Indicator 25 of IMAP, which is recommended to become a common indicator in the Revised Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria (UNEP/MED WG. 595/Inf.4)

Ecological Objective 9 (EO9):	Contaminants cause no significant impact on coastal and marine ecosystems and human health		
Operational Objective	Indicator	GES Definition	GES 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 (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

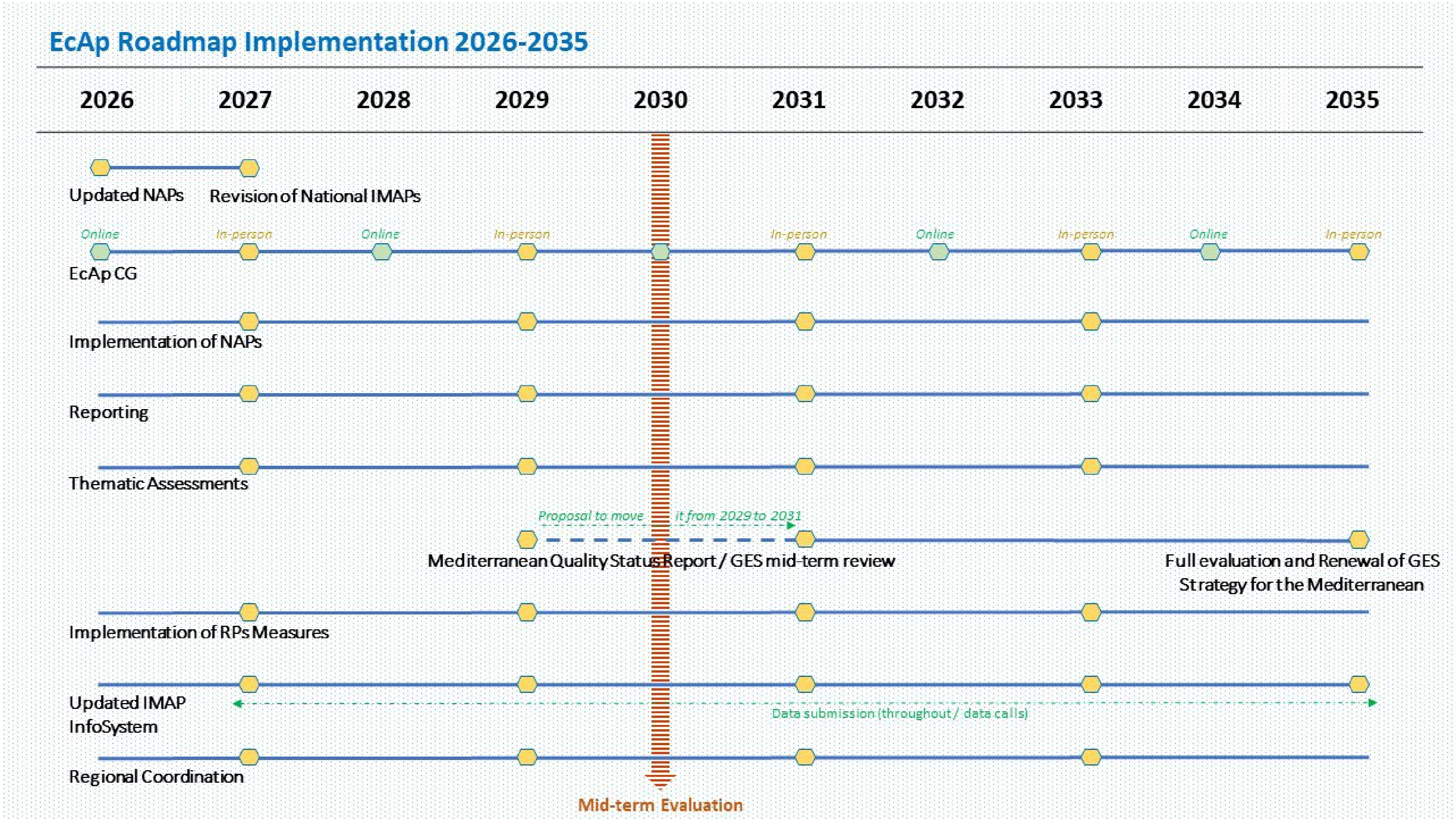
9.5 Water quality in bathing waters and other recreational areas does not undermine human health	9.5.1 Percentage of intestinal enterococci concentration measurements within established standards (Common Indicator 21)	Concentrations of intestinal enterococci are within established standards	• Increasing 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.

Ecological Objective 10 (EO10):	Marine and coastal litter do not adversely affect coastal and marine environment		
Operational Objective	Indicator	GES Definition	GES 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.

Ecological Objective 11 (EO 11)~~[23]~~:	Noise from human activities causes no significant impact on marine and coastal ecosystems		
Operational Objective	Indicator	GES Definition	GES Targets
11.1 Energy inputs into the marine, environment, especially noise from, human activities, are minimized[24]	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)[25]	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)[26]	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.

~~[23] The Joint Meeting of the Ecosystem Approach Correspondence Groups on Pollution and Marine Litter Monitoring (Anavyssos, Greece, 27–28 May 2025) agreed to endorse the updated Candidate Common Indicators 26 and 27 for submission to the MED POL Focal Points Meeting, with a view to also addressing concerns related to the mandatory implementation of noise monitoring, following the acceptance of the Secretariat – MED POL's proposal that countries should consider including Candidate Common Indicators 26 and 27 in their national IMAP-based monitoring programmes.~~
~~The MED POL Focal Points Meeting (Athens, Greece, 17-19 June 2025), reviewed Working Document UNEP/MED WG.627/5/Rev.1, "Revised IMAP: Pollution, Litter and Noise Cluster". It 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 invited the EcAp Coordination Group to take the final decision whether Candidate Indicators 26 and 27 can be upgraded as Common Indicators.~~
[24] Decision IG.20/4, Annex II
[25] Decision IG.20/4, Annex II; IG.22/7
[26] ibidem

Appendix 2: Timeline for EcAp Roadmap and Policy Implementation (2026 – 2035)



Appendix 3: Main Scope of Actions Referring to the Ecosystem Approach (EcAp) Policy (2026-2035)

1. ***Protect and Restore Marine Biodiversity*****:** Expanding Marine Protected Areas (MPAs) as well as establishing Other Effective Area Based Conservation Measures (OECMs) with the aim to protect at least 30% of the Mediterranean Sea by 2030 is a cornerstone goal, as reinforced by the 2023 MED QSR. However, beyond spatial targets, effective management must be prioritized. Management plans, surveillance, and enforcement capacity for MPAs requires significant improvement, including their integration into national policies. Ecologically and Biologically Significant Areas (EBSAs) ~~should /receive targeted conservation attention~~ will continue to guide conservation action. Restoration of degraded habitats, especially seagrass meadows, in particular the Posidonia seagrass meadows *inter alia*, coralligenous reefs, and coastal lagoons, will enhance biodiversity and bolster climate resilience. The dissemination of best practices should be ensured to effectively prevent, control, and manage non-indigenous species. Priority must be given to reversing habitat degradation trends identified by the 2023 MED QSR, particularly in coastal and estuarine environments. These efforts will contribute to Target 3 of the Kunming-Montreal Biodiversity Framework through the implementation of the Post-2020 SAP BIO for the marine and coastal environment, adopted at the COP 22 of the Barcelona Convention. Decisive and coordinated actions are also needed to promote sustainable fisheries and intensify efforts against illegal, unreported, and unregulated (IUU) fishing, which continues to undermine the sustainable use of marine resources in the Mediterranean.

2. ***Prevent and Reduce Pollution***: Emphasis must be placed on addressing pollution at its sources, particular through the implementation of the 2026–2035 National Action Plans (NAPs) and Programmes of Measures (PoMs), serving as key operational policy tools for the effective enforcement on the LBS Protocol-based suite of Regional Plans on Urban Wastewater Treatment and Sewage Sludge Management, Marine Litter Management, Agriculture Management, Aquaculture Management, and Urban Stormwater Management. Their implementation is essential for achieving Good Environmental Status (GES) of the Mediterranean Sea. It is also crucial to ensure coherence between the NAPs and other relevant national policies and strategies. Continued emphasis must be placed on identifying and addressing the environmental impacts stemming from key sectors—agriculture, industry, aquaculture, tourism, infrastructure, energy production, ports, maritime works and structures, and maritime activities—alongside the growing impacts of climate change. These combined pressures continue to hinder progress toward achieving GES of the Mediterranean marine environment.

3. Priority should be given to assessing the impacts of pollution pressures, by ensuring regular monitoring of the IMAP list of mandatory organic and inorganic contaminants, biological effects, microplastics, pharmaceutical residues, and contaminants of emerging concern. This should be complemented by identifying legacy pollutants and encouraging pollution prevention rather relying solely on environmental remediation. Upgrading and further developing assessment criteria for contaminants and biomarkers, including through the integration of toxicity consideration into future Good Environmental Status (GES) assessments, and combining chemical and biological effects monitoring and evaluation—alongside improving data availability and quality—remain key priorities to accelerate the achievement of GES, as highlighted by the 2023 MED QSR and the revised IMAP.

4. Nutrient pollution reduction must be addressed by promoting sustainable agricultural, aquaculture, industry, tourism, upgrading wastewater treatment facilities, limiting fertilizers use, and enforcing stricter pollution controls Establishing assessment criteria for GES regarding nutrients across all Mediterranean sub-regions, defining water typologies, and ensuring the application of statistical tools for data validation and calculation of assessment criteria are essential. Additionally, incorporating satellite-derived chlorophyll-a data as a supplementary parameter alongside in situ measurements remains a priority to support accelerated progress toward GES related to nutrients, as identified in the 2023 MED QSR and the revised IMAP.

5. The 2023 MED QSR also recommends integrating nature-based solutions, such as restoring wetlands, into pollution control strategies. Following the anticipated adoption of an international legally binding instrument on plastic pollution—which adopts a comprehensive approach addressing the entire lifecycle of plastics—a zero-tolerance approach toward marine litter must be enforced. To achieve this, the implementation ofcircular economy principles, extended producer responsibility schemes, and robust wastewater and waste management infrastructures is essential. This includes recycling and material recovery facilities, as well as best practices for plastic waste management.

6. Effective implementation of the Particularly Sensitive Sea Area (PSSA) in the North Western Mediterranean Sea—a vital measure for protecting marine mammals from collision risks—requires collective effort. Equally important is the strict enforcement of the Sulfur Emission Control Area (SECA) regulations, alongside exploring the feasibility of establishing a Nitrogen Oxide Emission Control Area (NECA). Together, these actions are essential to minimizing the impacts of maritime transport on human health and the marine environment.

7. ***Prevent and Reduce Adverse Effects on the Coastline and Habitats***: All countries should continue to invest substantial efforts in monitoring and assessing changes in hydrographical conditions, as well as the adverse impacts of man-made structures on coastal ecosystems and landscapes. Priority should be given to the restoration of threatened coastal ecosystems and habitats, the definition of country-specific, sub-regional, and regional GES conditions, and the development of climate change-related indicators, as well as those measuring coastline changes. Efforts should also include the creation of a Digital Spatial Database and the standardization and harmonization of mapping methods across countries.

8. ***Develop and implement new indicators*:** Achieving GES for Hydrography and Noise Pollution will need comprehensive digital spatial database, simplified reporting methods, consistent monitoring, data quality, management measures, and apply noise reduction technologies for maritime traffic and seismic surveys.

9. ***Enhance Climate Resilience*:** Climate mitigation, adaptation and resilience measures need to be mainstreamed into all policies, including maritime and coastal planning policies, compatible with a trajectory to limit the temperature increase to 1,5°C above pre-industrial level. The 2023 MED QSR stresses the need to protect blue carbon ecosystems, such as seagrass meadows, salt marshes, and mangroves, as key climate mitigation assets. Their protection not only sequesters carbon but also strengthens coastal resilience against erosion and storm surges. Maritime Spatial Planning (MSP) must integrate climate vulnerability assessments to future-proof infrastructure and socio-economic activities. Adaptation strategies must be community-led, ecosystem-based, and inclusive of vulnerable groups such as small-scale fishers and coastal communities.

10. ***Strengthen Governance and Regional Cooperation under the Mediterranean Action Plan – Barcelona Convention***: Institutional capacities must be enhanced at both national and regional levels. The 2023 MED QSR highlights the need for improved cross-sectoral coordination, integration of marine and coastal policies. It emphasizes the importance of strengthening synergies between the Mediterranean Action Plan – Barcelona Convention, EU MSFD implementation, , the Union for the Mediterranean (UfM), the General Fisheries Commission for the Mediterranean, Regional Seas Conventions, RAMOGE, PELAGOS, and other frameworks. Effective implementation of concrete initiatives and actions—such as those within the "A Mediterranean: A Model Sea by 2030" Plan of Action (PAMEx), the BlueMed Partnership, the MedFund, and the WestMED initiative—is critical. Compliance and enforcement mechanisms must be improved to ensure that marine conservation commitments are translated into real-world outcomes. Special attention should be given to youth engagement in environmental issues, including through the modernization of education programs focused on sustainable development and global citizenship, in both formal and informal settings. Transparency, public access to information, public participation - including that of civil society, -and stakeholder co-management approaches need to

be mainstreamed into governance systems. All actors—local authorities, international organizations, financial institutions, civil society, academia, and the private sector, including industry—should embody a spirit of solidarity and strengthened regional collaboration to secure a clean, healthy, and sustainable marine environment.

11. ***Strengthening the Science-Policy Interface****:* Efforts will continue to focus on advancing integrated monitoring and assessment of the coastal and marine environment in a cost-effective manner, aligned with the EcAp Ecological Objectives and IMAP Common Indicators. These efforts aim to further enhance a comprehensive and integrated understanding of ecosystem conditions and the impacts of various pressures, including physical loss and disturbance, non-indigenous species, nutrient enrichment, species removal, and others.

12. It is therefore essential to continue embedding the science-policy interface as a cornerstone of EcAp policy implementation. To this end, the continued development and application of science-based management practices remain crucial. In particular, this should be achieved through the promotion and implementation of tools such as Source-to-Sea Management, Marine Spatial Planning, Nature-Based Solutions, Ocean Ecosystem Accounting, Mapping of Coastal and Marine Ecosystems, and the Compendium for Coast and Sea. These tools have considerable potential to enhance the protection, conservation, and restoration of coastal and marine ecosystems; support integrated coastal and ocean management; contribute to climate change mitigation and adaptation; and strengthen disaster risk reduction.

13. ***Enable a Sustainable Blue Economy*****:** Economic growth in the Mediterranean must be decoupled from environmental degradation**,** including through streamlining EcAp into the Marine Spatial Planning (MSP), Integrated Coastal Zone Management (ICZM), coast resilience and source-to-sea approach. Sustainable, low-carbon maritime transport, responsible coastal tourism, offshore renewable energy, and marine biotechnology sectors must be scaled up with clear environmental safeguards. A stronger sustainability criteria for emerging blue economy sectors, such as offshore aquaculture and renewable energy, ensuring that new economic activities do not undermine GES objectives.

14. The above scope of actions is currently addressed thought the measures defined in the framework of the legally-binding Regional Plans and Post-2020 SAPBIO, adopted in the framework of UNEP/MAP Barcelona Convention System (Table 1).

Table 1: Specific measures and timeline for their implementation in the framework of the legally-binding Regional Plans and Post-2020 SAPBIO, adopted in the framework of UNEP/MAP Barcelona Convention System.

Regional Plans on Urban Wastewater Treatment and Sewage Sludge Management in the Framework of Article 15 of the Land Based Sources Protocol (Decision IG.25/8)	
Urban Wastewater Treatment	
Art. V (6): All agglomerations are provided with collecting systems for urban wastewater for those with a population equivalent (p.e.) of more than 15,000	2025
Art. V (6): All agglomerations are provided with collecting systems for urban wastewater for those with a population equivalent (p.e.) between 2000 and 15,000	2030
Art. V (7): Adopt emission limit values as provided for in Appendix I of the Regional Plan for: (i) discharge of effluents from urban wastewater treatment plants to the environment; (ii) reuse of reclaimed wastewater for agriculture irrigation; and (iii) discharge of industrial wastewater into collecting systems and urban wastewater treatment plants	2025
Art. V (9): All discharges from agglomerations over than 15,000 p.e. are subject to the extent possible to tertiary treatment provided that the Good Environmental Status (GES) of the recipient environment is maintained	2030
Art. V (9): All discharges from agglomerations of size of between 2000 and 15,000 p.e. are subject to the extent possible to secondary treatment provided that the Good Environmental Status (GES) of the recipient environment is maintained	2030
Art. V (15): Competent authority or appropriate body adopt emission limit values appropriate to the nature of industry discharging industrial effluents to collecting systems connected to urban WWTPs	2025
Art. V (16): Industrial wastewater discharged into collecting systems and urban WWTPs shall meet, as a minimum, the emission limit values	2035
Other Measures[27]:	
Art. V (10): Promote nature-based solutions to the extent possible for small agglomerations of less than 2000 p.e.	n/a
Art. V (11): Ensure that urban wastewater treatment plants, built to comply with the requirements of Articles 7 and 8, are designed, constructed, operated and maintained to ensure sufficient performance under normal local climatic conditions	n/a
Art. V (12): Ensure that WWTPs are designed to account for seasonal variations of loads; volume and characteristics of the local municipal wastewater; and limitation of pollution of receiving water.	n/a
Art. V (13.i): Implement measures for segregating collecting systems for storm water and municipal wastewater, if technically and economically feasible;	n/a
Art. V (13.ii): Prevent or if not possible minimize sewage and wastewater treatment plants' overflow due to rainwater penetration and flooding;	n/a
Art. V (13.iii): Address impacts of points of discharge of treated wastewater;	n/a
Art. V (13.iv): Adopt tools for conservation of surface water runoff in built environment;	n/a
Art. V (13.v): Reduce pollutant loads and litter in storm water runoff from municipal and industrial sources.	n/a
Art. V (14.i): Promote the reuse of reclaimed wastewater.	n/a
Art. V (14.ii): Implement wastewater reuse systems	n/a
Art. V (17): Take measures to ensure regular monitoring of discharged effluent wastewater, receiving water, reclaimed wastewater and industrial effluents	n/a
Art. VI (18): Collaborate to implement, exchange and share best practices directly or with the support of the Secretariat	n/a
Art. VIII (18): Report on implementation of measures stipulated in this Regional Plan in line with the reporting requirement and timelines provided in Article 26 of the Convention and Article 13, paragraph 2(d) of the LBS Protocol	n/a
Urban Wastewater Treatment and Sewage Sludge Management	
Art. V (7): Contracting Parties shall adopt Class A biosolids suitable for use as fertilizer for agricultural crops having met the pathogen reduction requirements set in Table 1 by treatment processes	2025
Art. V (8): Contacting Parties shall adopt limit values for heavy metals to ensure that use would not affect human health and the environment as provided for in Table 2 (heavy metals in biosolids) and Table 3 (heavy metals in soil)	2025
Art. V (12): Contracting Parties shall establish the required infrastructure for the implementation of the requirements of the applicable measures of this Regional Plan with regards to the use for agricultural land applications and/or for energy/nutrient recovery	2025

[27] Other measures that the Contracting Parties legally commit to undertake as per the Regional Plan with no specific deadlines

Other Measures[28]:	
Art. V (7): Set classes for sludge with limit values for pathogen contents for biosolids to ensure that use would not affect human health and the environment	n/a
Art. V (7): Consider adopting Class B biosolids suitable for use as fertilizer for non-food crops having met the pathogen reduction requirements set in Table 1 by treatment processes	n/a
Art. V (9): Specify the conditions for use of sludge in its different states (stabilized, treated, untreated) taking into consideration the proximity of sludge application to various types of human activities and civil structure facilities/natural features	n/a
Art. V (10): In the event that limit values set in Tables 1 to 3 (pathogens and heavy metals in biosolids and soil) cannot be met, the Contracting Parties shall apply alternative means to agricultural use including incineration and regulated landfilling	n/a
Art. V (11): Apply adequate treatment processes to reduce volatile organic compounds and diminish possible odor emissions in the different stages of sludge treatment, transport and application in agriculture and other suitable uses	n/a
Art. V (13): Reduce energy costs and increase water savings during treatment by using BAT and applying BEP	n/a
Art. V (14): Implement technologies targeting energy efficient treatment of sludge such as pretreatment of sludge, solar drying, bio-drying, composting, etc.	n/a
Art. V (15): Promote implementation of adaptation measures for climate change protection	n/a
Art. V (16): Take measures to ensure monitoring of the quality of sewage sludge in the WWTP or after treatment outside the WWTP	n/a
Art. VI (17): Exchange and share best practices directly or with the support of the Secretariat including BAT, BEP, sustainable consumption and production, circular economy, resource efficiency, WEFE Nexus in the design, construction, operation and maintenance of the urban wastewater treatment plants	n/a
Art. VIII (19): Report on implementation of measures stipulated in this Regional Plan in line with the reporting requirement and timelines provided in Article 26 of the Convention and Article 13, paragraph 2(d) of the LBS Protocol	n/a

Regional Plan on Stormwater Management in the framework of Article 15 of the Land-Based Sources and Activities Protocol (LBS Protocol) (Decision IG.26/8)	
Art. V (6a): Establish a regulatory framework to develop stormwater management plans that include nonstructural and structural stormwater control measures	2028
Art. V (6b): Establish a regulatory framework to ensure that stormwater and other wastewater discharge plans, (in case of combined stormwater and sewage collection systems), are based on drainage boundaries instead of administrative boundaries	2028
Art. V (6c): Establish a regulatory framework to regulate future land use development aiming to maintain as much of its natural hydrology in order to minimize stormwater runoff, increase its infiltration, and harvest where possible rainwater for domestic or industrial or any other uses	2028
Art. V (6d): Establish a regulatory framework to identify the sources that contribute pollutants through stormwater and select the measures for pollution reduction	2028
Art. V (6e): Establish a regulatory framework to establish monitoring programmes for recipient water (e.g. lakes, water streams, groundwater, etc.), as appropriate in order to undertake the proper mitigation measures	2028
Art. V (7a): Implement the approved stormwater management plans by considering the implementation of Green Infrastructure (GI) that complements the piped networks in existing urban areas serviced with separate collection systems and Best Management Practices (BMP) in newly developed areas	2030
Art. V (7b): Implement the approved stormwater management plans by considering the construction of separate systems for municipal wastewaters (blackwater from toilets, greywater and industrial wastewater) and urban runoff in newly developed residential, commercial and industrial areas	2030
Art. V (7c): Implement the approved stormwater management plans by reducing the adverse impacts of untreated wastewater overflows discharging from existing combined collection systems of rainwater or snow melt, domestic sewage, and industrial wastewater in the same pipe	2030
Art. V (8a): Implement adequate seasonal maintenance of stormwater collection systems by maintaining an updated inventory list on storm water infrastructure and sources of pollution as well as sewage storage capacity structures	2028
Art. V (8b): Implement adequate seasonal maintenance of stormwater collection systems by planning and implementing regular road maintenance, street sweeping, storm-drain maintenance, stormwater hotline response, and landscape and park maintenance	2028
Art. V (8c): Implement adequate seasonal maintenance of stormwater collection systems by performing regular monitoring of quantity and quality stormwater at key urban stormwater structures	2028

[28] Other measures that the Contracting Parties legally commit to undertake as per the Regional Plan with no specific deadlines

Amendments to the Regional Plan on Marine Litter Management in the Mediterranean in the Framework of Article 15 of the Land Based Sources Protocol (Decision IG.25/9)	
Art. 8 (12): Take adequate regulatory measures to integrate the informal sector into regulated waste collection and recycling schemes	2028
Art. 8 (13): Establish, as appropriate, a regulatory framework for compostable plastics to be integrated into national waste management policies	2025
Art. 9 (15.2): Apply prevention measures aiming to achieve, to the extent possible, a circular economy for plastics (Regulate the use of primary microplastics, Implement Sustainable Procurement Policies, Establish voluntary agreements, Establish procedures and manufacturing methodologies, Identify single-use plastic products, Set targets to phase out production and use, increase the reuse and recycling, Phase-out chemical additives used in plastic products, Promote the use of recycled plastics, substitute plastics, Implement standards for product labelling, Establish dedicated collection and recycling schemes, minimize the amount of marine litter associated with fishing/aquaculture, Scale-up and replicate sustainable models)	2025
Art. 9 (15.3.a): Base urban solid waste management on reduction at source, applying the following waste hierarchy as a priority order in waste prevention and management legislation and policy: prevention, preparing for re-use, recycling, other recovery, e.g. energy recovery and environmentally sound disposal	2025
Art. 9 (15.3.b): Implement adequate waste reducing/reusing/recycling measures in order to reduce the fraction of plastic packaging waste that goes to landfill or incineration without energy recovery	2019
Art. 9 (15.3.c): Take the necessary measures to close to the extent possible the existing illegal dump sites on land in the area of the application of this Regional Plan	2020
Art. 9 (15.3.d): Identify and, to the extent possible, restore and contain, the coastal landfills that are a source of marine litter	2027
Art. 9 (15.3.f): Identify and assess impacts of marine litter accumulations in upstream regions of rivers and their tributaries, and apply measures to prevent or reduce their leakage into the Mediterranean	2025
Art. 9 (15.4.h): Explore and implement, to the extent possible, ways and means to charge reasonable cost for the use of port reception facilities or when applicable, apply No-Special-Fee system	2017
Art. 9 (15.4.i): Implement targeted measures aiming at preventing and reducing marine litter impact in Marine Protected Areas (MPAs) and Specially Protected Areas of Mediterranean Importance (SPAMIs)	2025
Art. 9 (15.4.j): Explore and implement to the extent possible “Gear marking to indicate ownership” concept and “reduced fishing catches through the use of environmental neutral upon degradation of nets, pots and traps concept	2017
Art. 9 (15.4.k): Apply cost-effective measures to prevent any marine littering from dredging activities	2020
Art. 10 (16.a): Explore and implement to the extent possible the identification in collaboration with relevant stakeholders’ accumulations / hotspots of marine litter and implementation of national programmes on their regular removal and sound disposal	2019
Art. 10 (16.b): Implement National Marine Litter Cleanup Campaigns on a regular basis and evaluate their effectiveness	2030
Art. 10 (16.c): Implement Marine Litter Cleanup Campaigns on a regular basis driven by beach; concessionaries/ managers/ local authorities, including outside the touristic season	2030
Art. 10 (16.d): Participate in International Coastal Cleanup Campaigns and Programmes	2019
Art. 10 (16.e): Apply as appropriate ‘Adopt-a-Beach’ or similar practices and enhance public participation role with regard to marine litter management	2019
Art. 10 (16.f): Apply Fishing for Litter in an environmentally sound manner, based on agreed guidelines and best practice, in consultation with the competent international and regional organizations and in partnership with fishermen and ensure adequate collection, sorting, recycling and/or environmentally sound disposal of the fished litter	2019
Art. 10 (16.g): Charge reasonable costs for the use of port reception facilities or, when applicable apply No-Special-Fee system, in consultation with competent international and regional organizations, when using port reception facilities for implementing the measures	2019
Art. 10 (17): Explore and implement to the extent possible the “Fishing for Litter” environmentally sound practices, in consultation with the competent international and regional organizations, to facilitate cleanup of the floating litter and the seabed from marine litter caught incidentally and/or generated by fishing vessels in their regular activities including derelict fishing gears	2017
Art. 10 (18): Explore and implement targeted activities for the localization and retrieval, and where possible, reuse or recycling of derelict fishing gear including through new environmentally sustainable technologies	2025
Art. 11 (19 to 21): Assessment of marine litter in the Mediterranean	2029
Art. 12 (22.b): Establish the Regional Data Base on Marine Litter which should be compatible with other regional or overarching databases	2016
Art. 12 (22.c): Establish Expert Group on Regional Marine Litter Monitoring Programme	2014

Art. 12 (23) : Design National Monitoring Programme on Marine Litter	2017
Art. 12 (25): Prepare the Guidelines for the preparation of the National Marine Litter Monitoring Programmes	2014
Art. 19 (35) : Prepare regional report on the implementation of the Regional Plan	2029
Other Measures[29]:	
Art. 7 (9): Consider updating periodically the LBS NAPs to integrate marine litter in accordance with the provisions of this Regional Plan and other means to perform their obligations	n/a
Art. 8 (11.a): Ensure institutional coordination, where necessary, among the relevant national policy bodies and relevant regional organizations and programmes, in order to promote integration	n/a
Art. 8 (11.b): Ensure close coordination and collaboration between national, regional and local authorities in the field of marine litter management	n/a
Art. 9 (15.1) Apply to the extent possible instruments needed to regulate and prevent marine litter pollution including plastic waste from land-based and sea-based sources, in particular the implementation of economic instruments, bans and design requirements, EPR, safe/formal markets for recycled plastics, fiscal and economic incentives, innovative business practices, best practices to create incentives)	n/a
Art. 9 (15.3.e): Apply enforcement measures to combat dumping, littering on the beach, illegal sewage disposal from land sources in the sea, the coastal zone and rivers	n/a
Art. 9 (15.3.g): Apply enforcement measures to prevent, reduce and sanction illegal dumping and illegal littering in accordance with national and regional legislation, in particular on coastal zones and rivers	n/a
Art. 9 (15.4.l): Take the necessary measures to ensure that cruise ships flying their flag or entering their ports implement the procedures for minimizing, collecting, storing, processing and disposing of garbage	n/a
Art. 9 (15.4.m): Take the necessary measures to promote best practices to prevent plastic waste and particularly single use plastic products in tourism and leisure activities including cruise shipping, including through regional cooperation	n/a
Art. 9 (15.4.n): Implement measures on prevention, response and remediation regarding litter from maritime accidents, including containers lost at sea	n/a
Art. 12 (24): Design National Monitoring Programme on Marine Litter to include: (a) harmonization and consistency with the integrated regional monitoring programme based on EcAp; (b) the need for litter monitoring in high sensitivity areas (endangered species, key habitats, etc.), and in Specially Protected Areas in the Mediterranean (SPAMIs); and (c) the need for litter monitoring in high sensitivity areas (endangered species, key habitats, etc.), and in Specially Protected Areas in the Mediterranean (SPAMIs)	n/a
Art. 14 (27): Prepare specific guidelines, taking into account where appropriate existing guidelines, to support and facilitate the implementation of measures provided for in articles 9 and 10 of the Regional Plan	n/a
Art. 16 (29): Enhance public awareness and education	n/a
Art. 17 (31): Encourage appropriate involvement of, and partnerships with, various stakeholders	n/a
Art. 18 (33): Cooperate directly or with the assistance of the Secretariat or the competent international and regional organizations to address transboundary marine litter cases	n/a

Regional Plan on Agriculture Management in the framework of Article 15 of the Land-Based Sources and Activities Protocol (Decision IG.26/6)	
Art. V (6a): Establish a regulatory framework with the objective to reduce and further prevent pollution caused or induced by nutrients discharged from agricultural activities	2028
Art. V (6b): Establish a regulatory framework with the objective to reduce and further prevent pollution caused or induced by irrigation water runoff and percolation	2028
Art. V (6c): Establish a regulatory framework for Integrated Pest Management as one of the tools that contribute to low-pesticide-input which keeps the use of pesticides only to levels that are economically and ecologically justified	2028
Art. V (6d): Establish a regulatory framework for Good management practices that contribute to reducing plastic waste generation from agricultural activities in the context of sustainable consumption and production and circular economy	2028
Art. V (7): Establish extension/advisory services, training programmes and awareness raising campaigns for farmers in order to promote implementation of the appropriate measures on the basis of the regulatory framework established as per Paragraph (6)	2030
Art. V (8): Enact support mechanisms to enable farmers to implement, as applicable, the appropriate measures for reducing inputs of pollutants and other wastes from agricultural activities on the basis of the regulatory framework established as per Paragraph (6)	2030
Art. V (9): Designate "vulnerable zones" as all known areas of agricultural land which drain into, and contribute to eutrophication of, coastal waters	2030

[29] Other measures that the Contracting Parties legally commit to undertake as per the Regional Plan with no specific deadlines

Art. V (10): Implement measures based on Good Agricultural Practices that contribute to the preservation of the health of the natural systems; further to application of smart strategies to enhance the water, energy and food Nexus; while considering the opportunities and synergies of all systems	2030

Regional Plan on Aquaculture Management in the framework of Article 15 of the Land-Based Sources and Activities Protocol (Decision IG.26/7)	
Art. V (6): Establish a regulatory framework that sets the operational requirements to be met by aquaculture facilities as a precondition to operate	2027
Art. V (7a): Establish institutional structures and take measures to enforce, as appropriate, the adopted operational requirements addressing the pollution control aspects	2028
Art. V (7b): Establish institutional structures and take measures to provide the framework conditions to encourage aquaculture facilities to adapt their operations further to BAT in aquaculture operations	2028
Art. V (8a): Take measures to verify that aquaculture facilities have established operational processes in order to control and reduce the release of potentially detrimental substances to the marine environment	2030
Art. V (8b): Take measures to verify that aquaculture facilities have established operational processes in order to implement measures to minimize pollution originating from aquaculture activities in the water column and sediments	2030
Art. V (9): Adopt regulations for measures that promote the sustainability of aquaculture in terms of fostering responsible, economically viable, environmentally sustainable aquaculture	2027
Art. V (10): Implement measures promoting responsible, economically viable, environmentally sustainable aquaculture as per the regulated aspects	2030
Art. V (11): Regulate key aspects contributing to the generation of plastic waste from aquaculture activities in the context of sustainable production, as well as processing along the value chain and circular economy	2028

Post-2020 Strategic Action Programme for the Conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region (Post-2020 SAPBIO) (Decision IG.25/11)	
1. SPECIES AND HABITATS PLANS Update Mediterranean action plans for selected species and habitats listed under the SPA/BD Protocol.	2030
2.SPECIES RECOVERY Develop recovery plans and implement emergency actions for endangered and threatened species whose continued survival depends on such actions, including their habitats.	2030
3.MARITIME TRAFFIC Reduce the impact of maritime traffic (noise & collision) on sensitive marine species (Cetaceans, Turtles, others).	2030
4.NIS/IAS COMMITMENT Ratification of the International Convention for the Control and Management of Ballast Water and Sediments from Ships (BWM Convention), and adoption of the Regional strategy addressing ship’s ballast water management and invasive species (2022-2027).	2030
5. NIS/IAS CAPACITY Strengthen the capacity of the Mediterranean countries to deal with alien marine species.	2030
6. NIS/IAS CONTROL Take the necessary field actions to mitigate the impact from NIS/IAS.	2030
7. LITTER Prevent leakage and remove marine litter to mitigate its impact on the ecosystem.	2030
8. EIA/SEA Implement environmental assessments, considering cumulative impacts on the coastal zones and their carrying capacity.	2030
9. WIND ENERGY Advocate that wind farms, are regulated in MCPAs, and cannot be developed elsewhere before their effects on the marine environment, biodiversity and human activities have been sufficiently researched, the risks are understood and alternatives assessed.	2030
10. MINERALS In line with the precautionary principle, the exploitation of minerals should not be authorized until the effect on the marine environment, biodiversity and related human activities have been sufficiently researched and the risks are understood, and alternatives assessed.	2030
11. SPATIAL PLANNING Support countries for the development of systematic conservation planning taking into account ICZM, land use/ marine use planning and management aspects in the context of MSP.	2030
12. RESTORATION Support restoration of ecosystems providing key services, those degraded and expected to become increasingly critical in a changing climate, such as wetlands and shallow seashore habitats among others.	2030

13. CLIMATE CHANGE Increase climate change impacts monitoring and contributions to mitigation and adaptation, particularly to warming, acidification, and to disaster risk reduction, through nature-based solutions and ecosystem-based approaches.	2030
14. GOOD ENVIRONMENTAL STATUS Promote actions, including scientific research, with the view of achieving GES for all biodiversity-related ecological objectives within the Ecosystem Approach EcAp/ IMAP.	2030
15. MCPAs and OECMs Assist countries in the implementation of the Post-2020 Regional Strategy for MCPAs and OECMs.	2030
16. BIODIVERSITY PLATFORM Establish an open access Mediterranean Biodiversity Platform.	2027
17. INVERTEBRATES Survey distribution and abundance, and assess status and main anthropogenic pressures, over priority invertebrate species with focus on C. rubrum, P. nobilis, and vermetid platforms.	2030
18.VERTEBRATES Establish the distribution, status, and the main anthropogenic pressures of species listed under Annex II to the SPA/ BD Protocol.	2030
19. HABITATS In coastal and offshore waters, inventory and cartography key Mediterranean habitats, and assess their status and main anthropogenic pressures.	2030
20. NIS/IAS Database Develop the shared georeferenced database (MAMIAS), user-friendly platform, to continuously monitor the status and pathways of non-indigenous species and support early warning.	2030
21. OVERFISHING and IUU Implement science-based management plans to effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing, including phasing out harmful fisheries subsidies which contribute to overcapacity and overfishing.	2030
22. BY-CATCH Develop a national mechanism and implement agreed and scientifically tested by-catch mitigation measures, to eliminate all intentional or accidental killing of threatened or endangered species and/or in bad conservation status.	2030
23. SMALL SCALE FISHERIES Promote the FAO Voluntary Guidelines for Securing Small Scale Fisheries (VGSSF) and co-management practices in professional small-scale fisheries, advised by traditional ecological knowledge and the best available science.	2030
24. AQUACULTURE Support developing the Post-2020 GFCM Aquaculture and Fisheries strategy - transforming the aquaculture industry through science-based solutions and marine spatial planning (MSP) tools.	2030
25. TOURISM Develop a framework of specific indicators for assessing the impact of marine and coastal tourism on destinations and for promoting ecotourism.	2030
26. INTEGRATING BIODIVERSITY Integrate biodiversity values into national and local development planning processes, into the strategies and planning processes of marine-related economic sectors, into national accounting as appropriate, reporting systems, and into the assessment of environmental impacts.	2030
27. STREAMLINE Post-2020 SAPBIO Streamline the Post- 2020 SAPBIO and Regional strategies and action plans, developed in the framework of the SPA/BD Protocol, into national strategies, action plans and legal frameworks.	2030
28. POLITICAL WILL AND COORDINATION Ensure political will and recognition at the highest levels of Government or State, to develop appropriate governance schemes, in particular cross-sectorial and multi-level institutional coordination.	2030
29. STAKEHOLDER PARTICIPATION Facilitate stakeholder engagement to address conflict between users, build capacity to contribute to the SAPBIO enforcement, particularly in MPA planning and management, through proper participation of all stakeholders in a transparent decision-making process.	2030
30. TOP-DOWN AND BOTTOM-UP SCALING OF INTERNATIONAL COMMITMENTS Scale down international commitments into national plans and to local level, streamlining the approach, targets and actions of the Post-2020 into national strategies and into local planning processes, while facilitating the bottom-up feeding of local proposals into future planning processes at the national and Mediterranean levels.	2030
31. COMPLIANCE AND ENFORCEMENT Enable the compliance of the provisions of the SPA/BD and the ICZM Protocols and related Action Plans at national level by strengthening capacities and cooperation between judiciary and administrative bodies.	2030

32. IMAP REFINEMENT Identification of the gaps that hinder the good environmental status evaluation, and in case needed, support countries to fill them out.	2030
33. IMAP IMPLEMENTATION Update national monitoring programmes in light of the new elements of IMAP and achieve regular reporting.	2030
34. Post- 2020 SAPBIO MONITORING Allow the Contracting Parties to periodically review and report, harmonized with IMAP and UNEP/MAP monitoring frameworks, on the status of implementation of the Post-2020 SAPBIO.	2030
35. SUPPORT TO RUN THE SAPBIO Provide sufficient human and financial resources to the MAP system in order to efficiently run the implementation, follow-up and assessment mechanisms for the Post-2020 SAPBIO.	2030
36. CAPACITY BUILDING FOR THE Post-2020 SAPBIO AT NATIONAL LEVEL Enhance the national capacities to implement the Post- 2020 SAPBIO, to manage MPAs and vulnerable marine and coastal habitats and species within and across national jurisdictions, with particular attention to less developed countries, and towards reducing the gender and the digital divide.	2030
37. NETWORKING Support existing regional, subregional and/or transboundary networks, or develop new ones as needed, to enhance capacities, knowledge, experience and opportunity sharing, inter alia, on topics as NIS/IAS, migratory species, MPA management, habitat restoration, reduced by-catch, harmonized monitoring, compliance with law and regulations, and other subjects relevant to the Post- 2020 SAPBIO.	2030
38. AWARENESS Increase awareness, understanding and appreciating of the values and threats to the marine environment, stimulating improved behaviour, and of the responses and good practices, by targeting decision-makers and the general public, through reinforced and renewed mechanisms, including mass communications.	2030
39. OUTREACH AND EDUCATION Promote the integration of marine biodiversity and ecosystems conservation concerns into school, higher education, professional training, and citizen science, so that best practices and innovative technologies to protect marine and coastal ecosystems are more accessible and replicable.	2030
40. EMPLOYMENT Adequately increase the employment, notably public employment in direct relation to marine biodiversity conservation (and eventually include redirecting existing one) as basic component for future blue economy wise development.	2030
41. SUSTAINABLE FUNDING Develop sustainable funding strategies with, as appropriate, innovative approaches to mobilize alternative financial sources, covering fiscal incomes that could be redistributed, and relevant actions to fund, including The MedFund and other types of national or local financing mechanisms.	2030
42. COOPERATION Increase cooperation both north/ south, south /south, and between governmental and non-governmental actors at different levels, to support the Post-2020 SAPBIO, particularly in the less developed countries.	2030

Appendix 4: ~~Possible~~ Products and Interaction between EcAp Governance Bodies

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 5: Terms of reference (TORs) for Ecosystem Approach Correspondence Groups on Monitoring (CORMONs), Economic and social analysis (COR ESA) and Online Working Groups (OWGs)

1. Ecosystem Approach Correspondence Groups on Monitoring (CORMONs)

1.1 Composition

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

2. 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.

1.2 Operation

3. 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.

4. 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.

1.3 CORMON Mandate

5. 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.

6. 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.

7. 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

8. 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.

9. Informal 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.

10. The informal OWG do not replace the formal Correspondence Groups.

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

12. 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.

2. Correspondence Group on Economic and Social Analysis (COR ESA)

2.1 Composition

13. The Correspondence Group on Economic and Social Analysis (COR ESA) is composed of national experts designated by the Contracting Parties and invited experts and coordinated by Barcelona Convention/UNEP-MAP Coordinating Unit and Plan Bleu/RAC. The Group also includes representatives of the other UNEP/MAP Components as well as international experts selected by the Contracting Parties through Plan Bleu/RAC Focal Points and/or by the Secretariat for their experience in similar initiatives or for their scientific expertise.

2.2 Operation

14. The work of COR ESA is supported by Plan Bleu RAC under the overall coordination of the Coordinating Unit.

2.3 Mandate

15. The COR ESA is responsible for the following:

- Preparing and guiding the socio-economic assessments
- Preparing the socio-economic chapter of the Mediterranean Quality Status Report (QSR)
- Undertaking analyses of the socio-economic aspects of national programmes of measures
- Supporting Contracting Parties to undertake socio-economic analyses at the national level
- Developing methodological tools with regard to socio-economic assessments

3. Effective interaction among different MAP bodies

16. 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 also provides information on the type of documents to be reviewed by each body.

Appendix 2

Integrated Monitoring and Assessment Programme for the Mediterranean Sea and Coast and Related Assessment Criteria (IMAP) (Third Cycle)

1. Introduction

1. Monitoring and assessment, based on scientific knowledge, of the sea and coast is the indispensable basis for the management of human activities, in view of promoting sustainable use of the seas and coasts and conserving marine ecosystems and their sustainable development. The Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria (IMAP) adopted in 2016 (Decision IG.22/7 – COP19) describes the strategy, themes, and products that the Contracting Parties to the Barcelona Convention are aiming to deliver, through collaborative efforts, over the first (2008 – 2015) and second cycle (2016 – ~~2021~~2024) of the implementation of the Ecosystem Approach (EcAp) Process, and the third cycle (~~2022~~ 2026 – 20~~28/2030~~35) which is underway, in order to assess the status of the Mediterranean sea and coast, as a basis for further and/or strengthened measures.

Background:

2. IMAP builds on the monitoring and assessment related provisions of the Barcelona Convention and its Protocols, previous Decisions of the Contracting Parties related to monitoring and assessment, and a number of Decisions related to the preparation of the 2017 and 2023 Mediterranean Quality Status Reports and the implementation of EcAp Roadmap.

3. In addition, the development of IMAP has duly taken into account the implementation of the Contracting Parties' monitoring and assessment programmes, as well as practices of other Regional Sea Conventions and other Regional bodies.

Timeline:

4. Significant progress was made in achieving IMAP's objectives and targets during its second phase (2016-2021). This implies in practice that the existing national monitoring and assessment programmes were reviewed and revised as appropriate so that national implementation of IMAP and regional and sub-regional assessments can be fulfilled in an effective manner, including updated GES definitions and targets, further refinement and establishment of assessment criteria, development and implementation of the GES and alternative environmental assessment alongside the assessment scales, harmonization and standardization of monitoring practices, advancement of data management and data Quality Assurance and Quality Control (QA/QC).

5. Furthermore, the 2017 and 2023[1] Mediterranean Quality Status Reports (MED QSR) as well as the 2019 State of Environment and Development Report (SoED) were built based on the structure, objectives and data reported under IMAP. The validity of the IMAP should be reviewed once at the end of every EcAp cycle, and in addition it should be updated and revised as necessary on a mid-term basis, based on lessons learnt of the implementation of the IMAP and on new scientific and policy developments.

2. IMAP Common Principles and Structure

2.1 Overarching Principles[2] and the Overall IMAP Structure

6. The key elements addressed through IMAP, in line with Decision IG.22/7 of COP19, are the Common Indicators, monitoring and assessment methodologies for all IMAP clusters (i.e., Biodiversity and Non-Indigenous Species, Pollution and Marine Litter, Coast and Hydrography), as well as assessment criteria. On the other hand, the objectives, indicators, GES definitions and targets are also part of the

[1] https://medqsr2023.info-rac.org/
[2] Clarification about the IMAP principles are provided in the Integrated Monitoring Guidance Document and respective Indicators' Guidance Factsheets.

Ecosystem Approach (EcAp) Roadmap implementation.

7. The overarching principles guiding the development, implementation and revision of the IMAP include**:** (i) adequacy; (ii) coordination and coherence; (iii) data architecture and interoperability based on common parameters; (iv) concept of adaptive monitoring; (v) risk-based approach to monitoring and assessment; and (v) the precautionary principle in addition to the overall aim of integration. In line with the above overarching principles, data and information is gathered through integrated monitoring activities on the national level and shared in a manner that creates a compatible, shared regional pool of data, usable by each Contracting Party.

8. The IMAP information system (Info System) ensures the establishment of a regional data repository which will allow the production of common indicator assessment reports in an integrated and harmonized manner, following the monitoring procedures and standards and data provided, thus ensuring comparability across the Mediterranean region.

9. In line with the above, integration is achieved through IMAP implementation at regional and national levels, through the standardized and harmonized monitoring systems, following common principles undertaken in a coordinated manner, with the overall aim to assess the Good Environmental Status (GES) of the marine and coastal environment.

2.2 IMAP Monitoring

10. The IMAP monitoring requirements focus on, based on agreed Common Indicators and related parameters, the prevailing anthropogenic pressures and their impacts, and the progress towards the GES (Ecological Objectives and Targets). The monitoring is carried out in such a way that an assessment with adequate confidence and precision is achieved.

11. IMAP sets out the basis on how the Contracting Parties should design and carry out their national IMAP-based integrated monitoring programmes and work together in the framework of the UNEP/MAP Barcelona Convention to produce quality-assured data of optimal quality across all common indicator to ensure reliable and up-to-date regional assessments on the status of the Mediterranean Sea and Coast.

12. Since 2016-2017, the Contracting Parties updated their existing monitoring programmes in order to enhance monitoring and assessment in line with the Indicator Guidance Factsheets developed under IMAP. It has to be noted that the Mediterranean has gone through a number of important advancement pertinent to IMAP implementation:

- Development of IMAP-based national monitoring programmes;
- Data reporting and submission through the IMAP Info System based on their existing national monitoring programmes;
- Establishment of region and four sub-regions wide assessment criteria;
- Setting a basis for the aggregation and integration of assessments across specific IMAP Common Indicators and Ecological Objectives, towards an integrated Good Environmental Status (GES);
- Establishment of the initial the assessment scales within the IMAP nested framework based on monitoring scales defined in national IMAP Pollution monitoring programme;
- Development and implementation of GES and alternative environmental assessment methodologies, alongside the assessment scales, assessment criteria, and the DPSIR approach;
- Development and implementation of standardized and harmonized monitoring procedures and standards;
- The 2017 and 2023 Mediterranean Quality Status Reports (MED QSRs).

13. During national implementation, the Contracting Parties have been encouraged to coordinate within and between each other in order to use resources in an efficient way. Shared monitoring stations and activities, information, and data could be steps towards this direction.

14. The IMAP assessment products, produced by the UNEP/MAP Secretariat, such as the MED QSRs and the 2019 State of Environment and Development Report in the Mediterranean (SoED), should be mainly based on the common indicators and monitoring data provided and verified by the ~~by~~ Contracting Parties, and/or complemented by satellite-derived data and reliable scientific literature as available for individual CP/groups or CPs.

15. In areas of scientific and/or data gaps, the assessment products can also build on relevant scientific projects, pilot outcomes, and comparable data of other regional organizations and in case these are not available, on scientific literature. In addition, they will analyze trends, drivers and will build on available socio-economic data. Without existing data or scientific work, expert consultation will be used to validate the final assessment.

16. The common indicator Guidance Factsheets provide information on the status of the environment and information needed to evaluate the severity of environmental problems and distance from GES targets of the ecological objectives.

17. The Indicator Guidance Factsheets are linked to specific indicators and together they set methodologies and statistical elaborations to assess whether the GES targets are met or not. Following the EO level assessment, the integrated assessment should take place on the state of the Mediterranean Sea and Coast.

18. The recent 2023 Mediterranean Quality Status Report was based on and structured along the respective Ecological Objectives and Common Indicators, by building on the guidance set in the established and approved common indicator Guidance Factsheets.

19. During the development of the above, an integrated approach for assessing GES was used, considering the Integrated Monitoring and Assessment Guidance Factsheets, describing state-based common indicators and relating them to the pressure-based indicators.

20. Some studies have been undertaken by UNEP/MAP to provide with practical solutions to structure, strengthen and sustain a "science-policy-interface" to support IMAP implementation, both for monitoring and assessment. These solutions touch upon evidence (science), outreach (policy) & engagement (human and financial means) and are valid for the 3 clusters of IMAP (Biodiversity and Non-Indigenous-Species, Pollution – Marine Litter, Coast and Hydrography).

21. As part of the EcAp governance structure, COR ESA meetings allow to work on the socio-economic characteristics of the Mediterranean Sea with information on demography, economy & employment and qualitative description of the links between human activities and the coastal and marine environment. To deeply assess the level of environmental and social sustainability of human activities that impact the coastal and marine environment, UNEP/MAP is measuring the sustainable blue economy based on a sustainability framework and associated core set of indicators.

2.3 UNEP/MAP Strategy Towards an Integrated Data and Information System

22. Assessments arising from monitoring data are critically dependent upon practical mechanisms for handling data from different activities that ensure that documents, data, and products are managed consistently and are easily available to users. This supports integrated assessments, for example from integrated biological and chemical programmes, or linking the observed changes in spatial distribution and temporal trends in substances or their effects to inputs into the UNEP/MAP Barcelona Convention maritime area.

23. Data storage and handling processes are therefore central, and it is important that the role of the various components in this is clear and continuously developed and strengthened.

24. IMAP thus requires an updated and integrated data and information system for UNEP/MAP Barcelona Convention with clear set roles for data handling and assessment for the various components and with a user-friendly reporting platform for Contracting Parties (IMAP Info System), based on the following strategic points:

- The UNEP/MAP Barcelona Convention data and information are collected according to the official MAP data policy approved at COP22 (Decision IG.25/10);
- The UNEP/MAP Barcelona Convention data and information system aims to support a reliable, quantitative assessment of the GES of the Mediterranean Sea and Coast;
- The UNEP/MAP Barcelona Convention data and information facilitate access and knowledge of the general public to environmental information.

25. Core elements of the UNEP/MAP Barcelona Convention integrated data and information system include:

- Data Standards (DSs) and Data Dictionaries (DDs) monitoring reporting formats based on IMAP Common Indicator factsheets and tools for data exchange;
- Relevant quality control for both data reporting by national IMAP users and data validation procedures within the IMAP Info System, as well as ensure assessment products are available in an integrated manner, on a common platform.

26. Data and information available using harmonized standards and practices, following the UNEP access-to-information policy (UNEP/EA. 1/INF/23).

27. IMAP Info System, developed during the second IMAP cycle, is fully operational and allows Contracting Parties to report data for 18 IMAP Common Indicators (i.e. 1, 2, 3, 4, 5, 6, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24) through 30 Information Standards.

28. IMAP Info System is accessible to the general public (http://imapinfosystem.info-rac.org/app/#/) and login is required only to access reserved sections. An IMAP Info System Technical Guide is available to help users in browsing the web site.

29. The structure of IMAP Info System is user-friendly and allows-easy navigation with three main section:

- Reporting (Standards, Conformity check, Upload);
- Explore (Published data, Geographical data, Dashboard, Utility tools);
- Info (Documents, Guidelines and tutorials, Info and contact).

2.4 Cooperation with Relevant Regional Bodies in the Context of IMAP Implementation

30. The current IMAP covers with agreed common indicators the Ecological Objectives (EOs) related to Biodiversity (EO1), Non-Indigenous Species (EO2), Harvest of Commercially Exploited Fish and Shellfish (EO3), Marine Food Webs (EO4), Eutrophication (EO5), Sea-Floor Integrity (EO6), Hydrographic alterations (EO7), Coastal Ecosystems and Landscapes (EO8), Contaminants (EO9), Marine Litter (EO10), and Energy including Underwater Noise (EO11).

31. In addition, ~~candidate~~ common indicators are included under EO11 (Energy including Underwater Noise), ~~with the intention to elevate their candidate status into common indicators~~ further to new scientific knowledge availability and projects' results supporting monitoring activities.

32. While some of the elements of fisheries (EO3) and marine food webs (EO4) are partly covered by the monitoring and assessment of EO1 and EO2 the Contracting Parties have agreed on the GFCM developed list of common indicators. In this regard, the monitoring and assessment specifics of EO3 are being developed by the GFCM, in close cooperation with UNEP/MAP.

33. In light of the above, UNEP/MAP has strengthened its cooperation with the relevant regional bodies, especially in relation to:

- EO1: with the General Fisheries Commission for the Mediterranean (GFCM) for commercial species of fish and shellfish, the International Union for Conservation of Nature (IUCN) and the Secretariat of the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS), Noting that the ACCOBAMS Survey Initiative II will provide important inputs, including: monitoring cetaceans and other marine species by tracking the distribution, abundance, and trends of cetaceans, sea turtles, seabirds, elasmobranchs, and pelagic fish; assessing human pressures such as pollution, underwater noise, fisheries interactions, ship strikes, and other anthropogenic threats; as well as enabling the early detection of environmental changes, including population declines, shifts in species distribution, and emerging threats related to climate change.
- EO3: with the GFCM, noting that EO3 Common Indicators are based on GFCM methodologies and assessed through its biennial SoMFi reports, which inform IMAP integrated assessments.
- EO5: with EMODnet, COPERNICUS and HELCOM to utilize alternative data sources, aiming to compensate for gaps in the *in-situ* data reporting within the IMAP Info System, and to support the development of assessment methodologies;
- EO9: with EMODNET, EEA, and MSFD Technical Bodies to enhance the use of alternative data sources to compensate for gaps in the *in-situ* data reporting within the IMAP Info System, and to support the development of robust assessment methodologies;
- EO10: with ACCOBAMS, in particular for floating marine litter (i.e., links with ACCOBAMS Survey Initiative (ASI[3]);
- EO11: with ACCOBAMS, noting that new scientific knowledge and project results supporting monitoring activities have led to the establishment of threshold values aimed at maintaining Good Environmental Status (GES) for both short-term and long-term exposure to impulsive noise events, and development of Initial GES Assessment Methodologies for impulsive and continuous noise. These advancements laid the foundation for elevating noise candidate indicators to full common indicators.

34. In addition, cooperation with other regional and international bodies will be key for the successful implementation of IMAP, to ensure that no double obligation is created for those Contracting Parties, which are Parties to various Regional Seas Conventions and/or members of the European Union and undertake monitoring activities under other specific frames.

35. Cooperation with other regional and international bodies can also strengthen the cost- efficiency and scientific adequacy of IMAP. Exchange of best practices and information is encouraged during the IMAP implementation, both in between Contracting Parties participating in various monitoring programmes and in between UNEP/MAP and other relevant regional, international bodies.

3. Key Elements of IMAP

3.1 Common Indicators

36. The common indicators are the backbone of IMAP.

37. In the context of the Barcelona Convention, a common indicator is an indicator that summarizes data into a simple, standardized, and communicable figure and is ideally applicable in the whole Mediterranean basin, or at least on the level of sub-regions, and is monitored by all Contracting Parties. A common indicator is able to give an indication of the degree of threat or change in the marine ecosystem and can deliver valuable information to decision makers.

38. Candidate indicators are indicators which still have many outstanding issues regarding their

[3] https://accobams.org/main-activites/accobams-survey-initiative-2/accobams-survey-initiative/

monitoring and assessment and therefore are recommended to be monitored in the initial phase of IMAP on a pilot and voluntary basis.

39. The Common and candidate indicators currently agreed, which are at the core of IMAP, include:

1) Habitat distributional range (EO1) to also consider habitat extent as a relevant attribute;
2) Condition of the habitat's typical species and communities (EO1 related to benthic and pelagic habitats);
3) Species distributional range (EO1 related to marine mammals, seabirds, marine reptiles);
4) Population abundance of selected species (EO1, related to marine mammals, seabirds, marine reptiles);
5) Population demographic characteristics (EO1, e.g. body size or age class structure, sex ratio, fecundity rates, survival/mortality rates related to marine mammals, seabirds, marine reptiles);
6) Trends in abundance, temporal occurrence, and spatial distribution of non-indigenous species, particularly invasive, non-indigenous species, notably in risk areas (EO2, in relation to the main vectors and pathways of spreading of such species);
7) Spawning stock Biomass (EO3);
8) Total landings (EO3);
9) Fishing Mortality (EO3);
10) Fishing effort (EO3);
11) Catch per unit of effort (CPUE) or Landing per unit of effort (LPUE) as a proxy (EO3);
12) Bycatch of vulnerable and non-target species (EO1 and EO3)
13) Concentration of key nutrients in water column (EO5);
14) Chlorophyll-a concentration in water column (EO5);
15) Location and extent of the habitats potentially impacted by hydrographic alterations (EO7)[4];
16) Length of coastline subject to physical disturbance due to the influence of human[5]-made structures (EO8);
17) Concentration of key harmful contaminants measured in the relevant matrix (EO9, related to biota, sediment, seawater);
18) Level of pollution effects of key contaminants where a cause-and-effect relationship has been established (EO9);
19) 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 (EO9);
20) Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood (EO9);
21) Percentage of intestinal enterococci concentration measurements within established standards (EO9);
22) Trends in the amount of litter washed ashore and/or deposited on coastlines (including analysis of its composition, spatial distribution and, where possible, source.) (EO10);
23) Trends in the amount of litter in the water column including microplastics and on the seafloor (EO10);
24) Trends in the amount of litter ingested by marine organisms and in the number of individuals entangled in marine litter (EO10);
25) Land cover change (EO8)[6];

[4] Several CORMON meetings agreed to simplify the original Guidance Factsheet in order to allow for monitoring of this indicator due to its complexity, requirements for historic data, significant human and financial resources required and alike. Some simplification has been already proposed however further steps are needed and agreed (for the last time at CORMON meeting in Marseille 28-29 March 2023). Title to be changed accordingly.
[5] Change of the term "man-made" to "human-made" in the title of the indicator due to gender equality reasons, further to the proposal that has been requested by the EU and several CPs.
[6] The CORMON Coast and Hydrography (Marseille, 28-29 March 2023) agreed to put this indicator to the list of Common indicators. The title should be "Land cover change". Testing has been done with several projects (SIDA, EcAp MED II and III, GEF MedProgramme) and results for the Adriatic sub-region were included in the 2023 MED QSR,

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 (EO11, ~~Candidate Indicator~~);
27) Levels of continuous low frequency sounds with the use of models as appropriate (EO11, ~~Candidate Indicator~~);
28) Trends in the amount of litter coming from riverine sources (EO10);
29) Biomass or abundance of species/genera/taxa or trophic groups (EO4, Candidate Indicator);
30) Average of Mean Trophic Level of species/genera/taxa or trophic groups from biomass and/or catches (EO4, Candidate Indicator);
31) Biodiversity indices (EO4, Candidate Indicator);
32) Pelagic/Demersal ratio (EO4, Candidate Indicator);
33) NIS/Demersal ratio (EO4, Candidate Indicator);
34) Zooplankton/ phytoplankton ratio (EO4, Candidate Indicator)[7];
35) Size distribution of trophic groups (EO4, Candidate Indicator);
36) Production of Megafauna (*Megafauna variables from EO1~~5~~) (EO4, Candidate Indicator);
37) Extent of physical loss of natural habitat (EO6);
38) Extent of adverse effects on benthic habitat (EO6).

40. During the implementation of IMAP since 2016, the CORMONs have played an instrumental role in further developing the respective common and candidate indicators towards common indicators as well as to further refine their specifics, including a number of technical elements, for the agreed common indicators, in particular on the assessment scales, in light of the ongoing implementation experience of IMAP.

Note on Geographic Reporting Scales:

41. A scale of reporting units' has been defined in the framework of IMAP taking into account both ecological considerations and management purposes, following a nested approach.

42. The nested approach aims to accommodate the needs of the above by taking into account 4 main assessment scales:

a) Whole region (i.e. Mediterranean Sea and Coastal Regions as defined by the Convention and its Protocols);
b) Mediterranean sub-regions the Western Mediterranean Sea, the Adriatic Sea, the Central Mediterranean, and the Aegean and Levantine Seas in the Eastern Mediterranean part, as presented in the Initial Assessment of the Mediterranean Sea (UNEP(DEPI)/MED IG.20/Inf.8), 2017 and 2023 MED QSRs;
c) Coastal waters and offshore marine waters; and
d) Subdivisions of coastal waters provided by Contracting Parties.

43. The work was undertaken by further developing the assessment scales of the nested approach.

3.2 Monitoring and Assessment of Biodiversity and Non-Indigenous Species related Common Indicators

Biodiversity (EO1):

44. Biological diversity is the "variability among living organisms from all sources, including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems".

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training sessions have been completed or are in progress for all GEF MedProgramme countries. The COP23 Decision on 2023 QSR proposes some technical elements for the Guiding Factsheet that have been inserted to the method.

[7] Data derived from EO1 (Pelagic Habitats Indicators)

45. The common indicators to be monitored and assessed in relation to biodiversity are as following:

Common Indicator 1: Habitat distributional range (EO1) to also consider habitat extent as a relevant attribute;

Common Indicator 2: Condition of the habitat's typical species and communities (EO1);

Common Indicator 3: Species distributional range (EO1 related to marine mammals, seabirds, marine reptiles);

Common Indicator 4: Population abundance of selected species (EO1, related to marine mammals, seabirds, marine reptiles);

Common indicator 5: Population demographic characteristics (EO1, e.g. body size or age class structure, sex ratio, fecundity rates, survival/mortality rates related to marine mammals, seabirds, marine reptiles).

46. Climate change represents a major long-term threat to Mediterranean biodiversity. To address this, future work should clarify the Guidance Factsheets and GES definitions, and integrate climate change impacts into indicators and methodologies, including the determination of baselines and thresholds. This may include~~s~~ not only the determination of baselines and thresholds but also consideration of shifting baselines and the adoption of a dynamic approach to biological community assessments.~~, since reference state themselves may evolve over time.~~

47. As it is not possible or even necessary to monitor all attributes and components of biological diversity throughout the region, IMAP monitoring is focusing, in line with the risk-based approach, on the most representative sites and species, which can showcase the relationship between environmental pressures and their main impacts on the marine environment. In light of the above, an updated reference list of species and habitats with a good representativity of Mediterranean marine biodiversity to be monitored is presented in Annex I, noting that those Contracting Parties who have the necessary means and are willing to do so can go beyond the monitoring requirements of this reference list.

48. The Contracting Parties while updating their national monitoring programmes, for the new six-year cycle, need to take into consideration the results of the MED QSR and to include at least the monitoring of the updated reference list species and habitats with, at least, two monitoring areas, one in a low-pressure area (e.g. marine protected area/ Specially Protected Area of Mediterranean Importance (SPAMI) and one in a high-pressure area from human activity).

49. To achieve a comprehensive assessment of the state of the Mediterranean Sea, it is essential to expand the monitoring protocols for EO1 CI1 and CI2, to include pelagic habitats. Currently, The Contracting Parties focus on Benthic habitats and specific types such as well illuminated infralittoral rock, algal-dominated infralittoral rock, *Posidonia oceanica* meadows, coralligenous, and circalittoral rhodolith beds provides valuable information about the benthic zone. However, to gain a full understanding of the ecosystem, it is crucial to also consider both benthic and pelagic zones, taking into account the anthropogenic pressures.

50. Two common indicators have been proposed for assessing the pelagic habitat of the Mediterranean Sea under the IMAP framework: CI1 and CI2. Contracting Parties are encouraged to use the agreed common reference list of pelagic habitat types, as well as operational objectives and indicators based on phytoplankton and zooplankton, to ensure coherent and coordinated monitoring across the region. The typology of pelagic habitats represents a general framework that can be adopted and modified by the Contracting Parties to integrate local ecosystems, features and dynamics.

51. Pelagic habitats are closely linked to several Ecological Objectives of the EcAp, particularly EO4 (Marine Food Webs) and EO5 (Eutrophication). Strengthening the connections between these objectives

requires improved data collection and sharing, as well as enhanced data harmonization and interoperability.

52. For EO1 CI1 and CI2, given the importance and vulnerability of *Posidonia oceanica* meadows in the context of climate change, the Contracting Parties shall make every effort to monitor the selected parameters of *Posidonia* meadow to ensure better protection of this essential habitat, which fulfills a functional role for many species, limits coastal erosion, and contributes to climate change mitigation. Additionally, parameters that could provide insights into their resilience to climate change impacts should also be studied and monitored.

53. The Mediterranean Sea harbours 11 cetaceans' species, which are subject to various human pressures, which reflect on their conservation status. The few species of cetaceans regularly present in the Mediterranean Sea should all be considered when updating the national monitoring programmes for the new six-year cycle. The Contracting Parties shall make every effort to identify a minimum of two species to be included in their national monitoring programme, based on the specificity of their marine environment and biodiversity, and taking into account that these species should belong to, at least, two different functional groups, where possible (Baleen whales / Deep-diving cetacean ~~toothed whales~~ / ~~Shallow-diving~~ other toothed species ~~whales~~). As far as possible, the choice of monitored species should be coordinated at sub regional scale to ensure coherence with cetacean population distribution in the Mediterranean Sea, as proposed in the Monitoring and Assessment Scales, Assessment Criteria, Thresholds and Baseline Values for the IMAP Common Indicators 3, 4 and 5 related to marine mammals.

54. Seabirds *sensu lato* form a crucial component of the region's marine biodiversity and ecosystem, with many of the relevant taxa being endemic or near-endemic to the Mediterranean. A list of priority species, which includes 11 representative species from a range of functional groups that can showcase the relationship between environmental pressures and their main impacts on the marine environment, was selected from Annex II of the Barcelona Convention. This list will be utilized for the assessment of the three relevant IMAP Common Indicators (CIs) related to seabirds according to the Monitoring and Assessment Scales, Assessment Criteria, Thresholds, and Baseline Values for the IMAP Common Indicators 3, 4, and 5 related to seabirds. As far as possible, the Contracting Parties should implement coordinated monitoring efforts within subdivisions or subregions to improve the representativeness of monitoring samples.

55. Monitoring and Assessment Scales, Assessment Criteria, Thresholds, and Baseline Values are available to the Contracting Parties for Common Indicators 1,2, related to three habitat types (Posidonia, coralligenous, and rhodoliths), as well as for Indicators 3,4 and 5 for related to seabirds, Marine Mammals, Marine Turtles (Annex I to the present document). The Contracting Parties are encouraged to use those elements while developing national assessments

56. The methodologies, quality control and quality assurance measures are available for Contracting Parties and have been considered in their IMAP-based national monitoring programmes, in line with the Integrated Monitoring and Assessment Guidance as well as the numerous technical guidelines prepared by SPA/RAC.

57. Regarding the assessment of biodiversity, it has to be noted that the quantitative definition of GES is difficult, considering the variety of assessment elements and the effects of climate change. The conceptual approach for a quantitative GES setting can be framed in a way that the resilience of the ecosystem is suited to accommodate the quantified biodiversity, or, in other words, it will be accounted in the determination of the GES boundaries as the "acceptable deviation from a reference state which reflects conditions largely free from anthropogenic pressures.

58. The scale of monitoring is of specific importance for biodiversity, due to the nature of the biodiversity related common indicators.

59. Furthermore, Data Standards (DSs) and Data Dictionaries (DDs) are available for the OE1

common Indicators (i.e., coralligenous, Rhodolith and *Posidonia oceanica* meadow's habitat, Marine Mammals, Marine Turtles and Marine Birds).

Non-Indigenous Species (EO2):

60. Non-indigenous species (NIS; synonyms: alien, exotic, non-native, allochthonous) are species, subspecies, or lower taxa introduced outside of their natural range (past or present) and outside of their natural dispersal potential.

61. Invasive alien species (IAS) are a subset of established NIS which have spread, are spreading, or have demonstrated their potential to spread elsewhere, and which have an effect on biological diversity and ecosystem functioning (by competing with and on some occasions replacing native species), socio-economic values, and/or human health in invaded regions.

62. The common indicator in relation to NIS is:

Common Indicator 6: Trends in abundance, temporal occurrence, and spatial distribution of non-indigenous species, particularly invasive, non-indigenous species, notably in risk areas (EO2, in relation to the main vectors and pathways of spreading of such species in the water column and seabed, as appropriate);

63. Non-indigenous species monitoring in the Mediterranean is a trend monitoring, where it is key to establish reliable, standardized monitoring and long-term data-sets as a first step of monitoring.

64. In addition, monitoring of non-indigenous species (NIS), following the risk-based approach, needs to be focused on the invasive alien species (IAS) in IAS introduction "hot spots" (e.g. ports and their surrounding areas, docks, marinas, aquaculture installations, heated power plant effluents sites, offshore structures). In addition, areas of special interest such as marine protected areas or lagoons may be selected on a case-by-case basis, as appropriate, depending on the proximity to alien species introduction hot spots.

65. With the application of the risk-based approach as stated above, it is possible to obtain an overview of the non-indigenous species present at a large spatial scope while only monitoring a relatively small number of locations.

66. Based on existing regional databases, such as the Marine Mediterranean Invasive Alien Species database, (MAMIAS), the "Andromeda" invasive species database for the Mediterranean and Black Sea, and the European Alien Species Information Network (EASIN), as well as subregional and regional Non-Indigenous Species (NIS) inventories, each Contracting Party should update the list of IAS to be monitored in its national monitoring programme at the start of each new phase of IMAP and start collecting data regarding these species.

67. Key next steps for GES assessment of NIS involve elaborating on CI6 aspects related to impacts by developing criteria and targets for vulnerable species and habitats. This should be coordinated with EO1 CI1 and CI2 and EO6 on sea-floor integrity. It is also crucial to assess the impact of Invasive Alien Species on habitat condition within EO1-CI2 and to include NIS impacts on seabed habitats in EO6, which is currently missing from IMAP.

68. The methodologies and quality control and quality assurance measures are available for Contracting Parties and have been considered in their IMAP-based national monitoring programmes, in line with the Integrated Monitoring and Assessment Guidance as well as the numerous technical guidelines prepared by SPA/RAC.

69. As the most effective monitoring method a Rapid Assessment Survey (RAS) will be carried out, at least yearly, by the Contracting Parties in hot-spot areas (e.g. ports and their surrounding areas, docks, marinas, aquaculture installations, heated power plant effluents sites, offshore structures). Contracting

Parties with the necessary resources are encouraged to use Environmental DNA (eDNA) surveys.

70. In addition, UNEP/MAP will develop during the next phase of IMAP citizen survey guidance for NIS, to enable Contracting Parties to use this additional cost-efficient methodology, which also strengthens public awareness and participation.

71. Guidance on monitoring non-indigenous species, monitoring and assessment Scales, Assessment Criteria, Thresholds, and Baseline Values are available and wide agreed for the Mediterranean with regards to Common Indicators 6. The Contracting Parties are encouraged to use those elements while developing national assessments, following the assessment criteria set out in the Integrated Monitoring and Assessment Guidance.

Harvest of Commercially Exploited Fish and Shellfish (EO 3):

72. The GES for EO3 is "Populations of selected commercially exploited fish and shellfish are within biologically safe limits, exhibiting a population age and size distribution that is indicative of a healthy stock".

73. The current IMAP framework for EO3 is based on the set of Common Indicators and operational objectives developed by the General Fisheries Commission for the Mediterranean (GFCM) and adopted under the Ecosystem Approach (EcAp) process. No revisions to the operational objectives, Common Indicators, GES definitions, or proposed targets are introduced in this document. The elements presented here remain aligned with the guidance factsheets agreed upon at the 6th Meeting of the EcAp Coordination Group and continue to serve as the technical basis for implementation under IMAP.

74. The Common Indicators under EO3 are the following:

Common Indicator 7: Spawning stock Biomass ;

Common Indicator 8: Total landings ;

Common Indicator 9: Fishing Mortality ;

Common Indicator 10: Fishing effort;

Common Indicator 11: Catch per unit of effort (CPUE) or Landing per unit of effort (LPUE) as a proxy ;

Common Indicator 12: Bycatch of vulnerable and non-target species (also relevant to EO1).

75. The GES definitions and assessment criteria for CI7, CI8, and CI9 follow GFCM's stock units, geographical sub-areas, and regional stock assessment methodology as outlined in the Data Collection Reference Framework (DCRF). These indicators are monitored according to GFCM sub-regional and species-specific guidance and remain valid unless formally revised by GFCM. They are assessed through the GFCM regional stock assessment process, with overall status and trends reported biennially in the State of Mediterranean and Black Sea Fisheries (SoMFi) report.

76. The status of EO3 in the 2023 Mediterranean Quality Status Report (2023 MED QSR), is provided by GFCM based on the most recently published SoMFi.

77. CI10, CI11, and CI12 are pending further methodological updates to incorporate recent advances. Their use in regular monitoring may be considered when standardized methodologies are finalized by GFCM.

Marine Food Webs (EO4):

78. Alterations to components of marine food webs caused by resource extraction or human-induced environmental changes do not have long-term adverse effects on food web dynamics and related viability.

79. The following are the Common Indicators related to Marine Food Webs:

Candidate Common Indicator 29: Biomass or abundance of species/genera/taxa or trophic groups

Candidate Common Indicator 30: Average of Mean Trophic Level of species/genera/taxa or trophic groups from biomass and/or catches

Candidate Common Indicator 31: Biodiversity indices

Candidate Common Indicator 32: Pelagic/Demersal ratio

Candidate Common Indicator 33: NIS/Demersal ratio

Candidate Common Indicator 34: Zooplankton/phytoplankton ratio

Candidate Common Indicator 35: Size distribution of trophic groups

Candidate Common Indicator 36: Production of Megafauna

80. Given the complexity of monitoring Ecological Objective 4 (EO4), it is recommended to adopt a step-by-step approach, starting with simple methods and indicators and gradually moving to more advanced ones. Key variables such as biomass, abundance, diet, and trophic levels of marine species, as well as commercial catches and fishing activities, can be useful starting points for estimating common indicators. These variables are generally available to all Contracting Parties through open-access platforms such as GFCM-DCRF, FishBase, FishStatJ, and Global Fishing Watch.

81. The assessment of EO4 is particularly challenging due to the complexity of food webs and the interactivity of the multiple pressures on ecosystems. In addition, there are still significant gaps in data availability, which makes it difficult to develop reliable indicators and link indicator changes to pressures, and consequently to set thresholds. Addressing these gaps is a prerequisite for setting common regional targets and ensuring harmonized monitoring across the Mediterranean.

82. The next phase should concentrate on establishing a robust knowledge base through coordinated data collection and the refinement of indicators relevant to food web dynamics. Once this foundation is established, it will be possible to define threshold values and align monitoring methodologies, in accordance with the criteria outlined in the Integrated Monitoring and Assessment Guidance.

Sea-Floor Integrity EO 6:

83. Sea-floor integrity is maintained, especially in priority benthic habitats.

84. The Sea-floor integrity Common Indicators are the following:

Common Indicator 37: Extent of physical loss of natural habitat

Common Indicator 38: Extent of adverse effects on benthic habitat (this may comprise several indicators which address specific pressures or particular aspects of habitat condition)

85. Contracting Parties shall implement EO 6 in close association with other state-based EOs (EO1, EO3, EO8), by making use of their Common Indicators, data and assessment results, where appropriate.

86. Monitoring and assessment efforts under Ecological Objective 6 should focus on collating data on the distribution and intensity of anthropogenic activities and pressures affecting the sea-floor, as a means to priorities monitoring of seabed state. This should also be conducted in coordination with the pressure-based Ecological Objectives (EO2, EO5, EO7), making use of their respective Common Indicators, data and assessment findings, as appropriate. Providing such information disaggregated by seabed habitat type in each assessment area is strongly recommended to facilitate its relevance and applicability within the context of EO6 assessments.

87. Ecological Objective 6 is intended to have a broad scope, encompassing all seabed habitats across the Mediterranean, from the littoral zone to the deep-sea floor. With regard to assessment scales and areas, Contracting Parties should use the agreed subdivisions of the Mediterranean region which are based primarily on biogeographic criteria, to ensure ecological coherence and comparability of results.

88. During the next phase, Contracting Parties are invited to define GES for EO6 habitats by setting quality thresholds for habitat condition, as well as acceptable limits for habitat loss and the extent of adverse effects and apply these to each habitat in an assessment area. In order to achieve GES for EO6, actions and measures should be prioritized towards those habitats and areas which are most affected by pressures (below threshold values and above acceptable limits) within each assessment area, in line with the EO6 focus on 'priority benthic habitats'.

3.3 Monitoring and Assessment of Pollution and Marine Litter related Common Indicators

Eutrophication (EO5):

89. 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.

90. 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).

91. 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.

92. 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.

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

94. 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.

95. 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.

96. 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.

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

98. 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 harmonize existing assessment tools.

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

100. 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.

101. 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):

102. 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.

103. 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).

104. 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.

105. 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.

106. 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.

107. 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.

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

109. 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.

110. 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.

111. 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.

112. 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.

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

114. 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.

115. 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.

116. 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):

117. Marine litter monitoring builds on the monitoring requirements of the Regional Plan on Marine Litter Management in the Mediterranean (Decision IG. 25/9, 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 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).

118. 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.

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

120. The Contracting Parties should use the agreed Baseline Values (BV) and Threshold Values (TV[8]) for Common Indicators 22, 23 and 24 of IMAP EO10 as presented in Annex II – Part II. GES/nonGES assessment classification scales build on the Threshold Values.

121. 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.

122. 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.

123. 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 2.5 cm.

124. 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.

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

126. 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.

127. 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.

128. 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 to undertake pilot~~s~~ monitoring, further research and work in this area (e.g., microplastics and mesoplastic on beaches, microplastics on sediment, pellets on beaches etc.).

129. 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

[8] Threshold Values (TV) for IMAP EO10 (Marine Litter) are subject to update for the third iteration of the MED QSR.

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 II – Part II).

130. 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)[9]:

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

132. 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.

133. ~~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.

134. In line with the above, the Contracting Parties should consider including progressively these two ~~Candidate~~ Common Indicators in their IMAP-based national monitoring programmes, taking into account national specificities.

135. 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.

136. 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.

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

3.4 Monitoring and Assessment of Coast and Hydrography related Common Indicators

Hydrography (EO7)[10]:

[9] Study reservation by Egypt
[10] Considering the momentum with regard to Climate-Change and the agreement in principle of the Meeting, that should consider Climate-Change, and the ongoing work of PAP/RAC on Coastal Degradation (EO7 and EO8), The Meeting agreed to recommend to the MAP Focal Points the possibility to receive a proposal from the respective CORMON by end of September 2025, to address the following: (a) the possibility to re-activate 7.1.1 (CI 15bis) and 7.1.2 (CI 15ter) already proposed under WG.630/3 (Appendix 1), and the possibility for the proposal of 1 to 3 Climate-Change related Common Indicator under EO8 (Coastal Ecosystems and Landscapes) considering that these indicators are measurable and that the

138. Monitoring under this ecological objective aims to address new developments of permanent alterations (constructions lasting for more than 10 years) that can potentially impact marine habitats. It is therefore closely related to CI 1 (EO1).

Common Indicator 15: Location and extent of the habitats potentially impacted by hydrographic alterations

139. Taking into considerations the difficulty in monitoring this indicator; due to its complexity, requirements for historic data, significant human and financial resources required and alike, several CORMON meetings agreed to simplify the original Guidance Factsheet in order to allow its implementation. Simplification has been already proposed and agreed by the Meetings of the CORMON on Coast and Hydrography in 2023 and 2025.

140. In line with the above, the monitoring under EO7 focuses on:

a) Mapping of the area where human activities cause permanent loss of the seafloor by the construction of the structure itself (i.e. the footprint of the structure);
b) Mapping of the surrounding area around the structure of potential changes to habitats; and
c) Intersection of the spatial map of the areas of these hydrographical changes (defined under (~~i~~a) and (~~ii~~b)) with spatial maps of habitats (deriving from EO1) to determine the areas of individual habitat types that are impacted by hydrographical changes. Until the habitat map from EO1 is available the Contracting Parties will use their own habitat maps.

Coastal Ecosystems and Landscapes (EO8)[11]:

141. One particularity of the IMAP (compared to other regional/RSC monitoring and assessment programmes) is the inclusion of an Ecological Objective focusing on the terrestrial part of the coastal zone. This reflects that the Barcelona Convention also covers coastal areas in its work, in line with the ICZM Protocol.

142. The coast related common indicator and candidate common indicator are as follows:

Common Indicator 16: Length of coastline subject to physical disturbance due to the influence of human-made structures

143. Based on the findings and recommendations of the 2023 MED QSR and experience from the first monitoring cycle (2018 – 2022), the Meetings of the CORMON on Coast and Hydrography in 2023 proposed minor technical improvements in the Guiding Factsheet including the inclusion of “archeological remains” and “other” structures (e.g. parking lots, quarries, pilings if not part of ports and marinas, etc.), as well as to consider off shore breakwaters as structures to be taken into account as artificial.

144. During the development of the national integrated monitoring programmes’ coastal component, the Contracting Parties, in line with the above, first need to assess the length of coastline affected by

methodology is clear. On this basis the Secretariat will include the proposal of the CORMON for the consideration of COP24.

[11] Considering the momentum with regard to Climate-Change and the agreement in principle of the Meeting, that should consider Climate-Change, and the ongoing work of PAP/RAC on Coastal Degradation (EO7 and EO8), The Meeting agreed to recommend to the MAP Focal Points the possibility to receive a proposal from the respective CORMON by end of September 2025, to address the following: (a) the possibility to re-activate 7.1.1 (CI 15bis) and 7.1.2 (CI 15ter) already proposed under WG.630/3 (Appendix 1), and the possibility for the proposal of 1 to 3 Climate-Change related Common Indicator under EO8 (Coastal Ecosystems and Landscapes) considering that these indicators are measurable and that the methodology is clear. On this basis the Secretariat will include the proposal of the CORMON for the consideration of COP24.

human-made structures in the current state, in line with the Indicator Guidance Factsheet, noting that the length of coastline subject to physical disturbance due to the influence of human-made structures is an impact indicator, which assumes that the coastlines occupied by human-made structures are potentially impacted areas.

145. For assessment of indicator on length of coastline influenced by human-made structures (CI16), definition of thresholds as % and / or m, to be developed, during the initial phase of IMAP, should be based on expert assisted procedure to take into account the typology of the coast including its ecosystem goods and services related to social and economic benefits. The assessment should also include disturbance that comes from such structures. The Guidance document "Assessment criteria and the Guiding document for application of assessment criteria for the IMAP Common Indicator 16" was endorsed by the Meeting of the CORMON on Coast and Hydrography in 2023, tested in Morocco and applied in Montenegro and Türkiye, should be used to define GES in other countries, as well as to define assessment requirements. This is also mandated by Decision IG.26/3 on "The 2023 Mediterranean Quality Status Report and a Renewed Ecosystem Approach Policy in the Mediterranean" (COP 23).

146. In line with the above, the monitoring under this Ecological Objective is meant to address human activities causing coastal artificialization by sealing the coast with the implementation of coastal structures and therefore impacting the coastal ecosystems and landscapes.

147. The term 'human-made structures' typically refers to different types of coastal defenses (such as seawalls, breakwaters, dykes etc.), ports/marinas, as well as to landward structures built on land, and intersect with the coastline.

Common Indicator 25: Land cover change

148. Based on the agreement by Contracting Parties representatives in the Meeting of the CORMON on Coast and Hydrography in 2023 and 2024, there is a sufficient ground for this candidate common indicator to become a common indicator, with the title "Land cover change". Testing of this indicator has been carried out within several projects (SIDA, EcAp MED II and III, GEF MedProgramme); results for the Adriatic sub-region were included in the 2023 MED QSR; training sessions have been completed or are in progress for all GEF MedProgramme countries.

149. In relation to Common Indicator on land cover change (CI25), Contracting Parties are encouraged to develop monitoring programmes and undertake monitoring activities in line with the pilot monitoring undertaken since 2016, undertaken in the Adriatic and presented in the 2023 MED QSR, as well as the training /capacity building activities and pilot projects implemented in GEF MedProgramme eligible countries. This indicator is very important for the analysis of processes, including land-sea interaction and climate change impact in coastal areas and allows countries to propose adequate measures to achieve GES and mitigate Climate Change impacts. It will bring more objectivity into reporting on the state and evolution of their coastal zones and implementation of the ecosystem approach in coastal zones.

Annex I

Updated Reference List of Species and Habitats, Assessment Criteria and Scales, Threshold and Baseline Values for Biodiversity and Non-Indigenous Species

Annex I: Updated Reference List of Species and Habitats, Assessment Criteria and Scales, Thresholds, Baseline Values for Biodiversity and Non-Indigenous Species

PART I: Reference List of Habitats and Species

1. Reference List of Habitats

Marine Benthic Habitat Types:

a. B1 Coralligenous
   i. MB1.55 Coralligenous (enclave of circalittoral)
   ii. MC1.51 Coralligenous cliffs (with 17 sub-types)
   iii. MC1.52a Coralligenous outcrops (with 9 sub-types)
   iv. MC1.52b Coralligenous outcrops covered by sediment (see MC1.52a for examples of facies)
   v. MC1.52c Deep banks (with 3 sub-types)
   vi. MC2.51 Coralligenous platforms (with 12 sub-types)
b. B2 Maërl
   i. MB3.511 Association with maërl or rhodoliths[12]
   ii. MB3.521 Association with maërl or rhodoliths
   iii. MC3.52 Coastal detritic bottoms with rhodoliths (with 9 sub-types)
c. B3 *Posidonia*
   i. *Posidonia oceanica* meadow (MB2.54 with 7 sub-types[13])

Pelagic Habitat Types

Table 1: Reference list of pelagic Habitat Types for the epipelagic layer (0-200m) (Annex VII of Decision IG.26/5)

	Pelagic Habitat Types	**Water mass**	**Comments***
A.1.	Reduced salinity water	coastal lagoons	WFD correspondence [14]
A.2.	Variable salinity water – high surface or subsurface CHL (>3 mg/m3)	estuaries, river plumes	Transitional waters with WFD correspondence 15 (Values should be revised)
A.3.	Marine water: neritic - medium surface or subsurface CHL (0.5-3 mg/m3)	upwellings, re-suspension in shallow waters and outskirts of river plumes, winter mixing areas	WFD water type II, type III
A.4.a	Marine water: oceanic - medium surface or subsurface CHL (0.5-3 mg/m3)	Upwellings, and winter mixing areas	WFD water type III
A.4.b	Marine water: oceanic - low to medium surface CHL (~0.1-1.0 mg/m3)	Hydrological features (fronts and gyres)	WFD water type III
A.5.a.	Marine water: oceanic - very low surface CHL (<0.1 mg/m3) with deep CHL maximum	euphotic depth > mixed layer depth	WFD water type III
A.5.b.	Marine water: oceanic - very low surface CHL (<0.2 mg/m3) without deep CHL maximum	euphotic depth < mixed layer depth	WFD water type III

* Each country should specify the range of Chl-a, Salinity, depth and if annual/seasonal values are used. The typology of pelagic habitats represents a general framework that can be adapted and modified by the Contracting Parties to integrate local ecosystems, features and dynamics.

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[12] MB3.511 and MB3.521 have the same habitat names but are listed under separate higher types (MB3.51 Infralittoral coarse sediment mixed by wave and MB3.52 Infralittoral coarse sediment under the influence of bottom currents).

[13] Sub-types for a) *Posidonia* on artificial substrata and b) *Posidonia* association with *Zostera noltii* are not specifically defined in BC or EUNIS habitat classifications.

[14] European Commission Decision 2018/229/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 Commission Decision 2013/480/EU (notified under document C (2018) 696) https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018D0229&from=PL

[15] WFD Annex 2 part 1.2.3. defines Transitional waters. see also Guidance document n.o 5 , Transitional and Coastal Waters, Typology, Reference Conditions and Classification Systems and Water Framework Directive Intercalibration Technical Report - Part 3: Coastal and Transitional Waters

2. Reference List of Species:

Marine Sea Birds:

Coastal top predators: *Pandion haliaetus*
Intertidal benthic-feeders: *Charadrius alexandrinus*
Inshore benthic feeders: *Gulosus aristotelis desmarestii*
Offshore surface-feeders: *Ichthyaetus audouinii*
Inshore surface feeders: *Croicocephalus genei, Thalasseus bengalensis emigrates, Thalasseus sandvicensis*
Offshore (surface or pelagic) feeders: *Hydrobates pelagicus melitensis, Calonectris diomedea, Puffinus yelkouan, Puffinus mauretanicus*

Marine Mammals

Cetaceans:

a) Baleen whales: fin whale (*Balaenoptera physalus*).
b) Deep-diving cetaceans: sperm whale (*Physeter macrocephalus*), Cuvier's beaked whale (*Ziphius cavirostris*), long-finned pilot whale (*Globicephala melas*) and Risso's dolphin (*Grampus griseus*).
c) Other toothed species: short-beaked common dolphin (*Delphinus delphis*), striped dolphin (*Stenella coeruleoalba*), common bottlenose dolphin (*Tursiops truncatus*).

Recommended rare species of cetaceans:

a) Harbour porpoise (*Phocoena phocoena*)
b) Rough-toothed dolphin (*Steno bredanensis*)
c) False killer whale (*Pseudorca crassidens*)
d) Killer whale (*Orcinus orca*).

Monk Seal:

- The Mediterranean monk seal (*Monachus monachus*)

Marine Turtles:

a) Loggerhead turtle (*Caretta*; IUCN (regionally) Least Concern).
b) Green turtle (*Chelonia mydas*; IUCN (globally) Endangered).

PART II: Assessment Criteria and Thresholds for Biodiversity Common Indicators 1 and 2

Table 2: Proposed parameters, metrics and indices for assessing CI1 and CI2 for the three habitat types at monitoring sites.

Habitat/CI	Minimum protocol	Optimal protocol
B1 Coralligenous **CI1**	Habitat extent (km²) Habitat loss (m²) Extent (km²) and proportion (%) of habitat loss across all monitored sites	Extent of habitat loss at assessment area/national level
B1 Coralligenous **CI2**	For MACS (Enrichetti et al., 2019): Extent of hard bottom (% rock and biogenic) Species richness of conspicuous megabenthic sessile and sedentary species Structuring species: count, height (cm) and density (no. of colonies/individuals m^{-2}) % sediment cover % of colonies with epibiosis, necrosis and entangled in lost fishing gears for all structuring anthozoans Marine litter (density m^{-2})	For EBQI[16] and other indices (Di Camillo et al., 2023): Typical species composition Condition of key species/groups: • Filter- and suspension feeders (cover and diversity) • Detritivores abundance • Related fish assemblage biomass (distinguishing piscivores, carnivores of invertebrates, planktivores) Sensitivity level
B2 Maërl **CI1**	Analysis of existing knowledge (scientific and grey literature) on the presence of maërl/rhodolith beds Habitat extent (km²)[17] Habitat loss (m²) Extent (km2) and proportion (%) of habitat loss across all monitored sites	Extent of habitat loss at assessment area/national level
B2 Maërl **CI2**	Index to be defined. Rhodolith/maërl (% cover live and dead) Rhodolith/maërl density	Index to be defined. Species composition: abundance and diversity (filter-feeders, carnivores, detritivores, etc.) including echinoderms Particulate organic matter cover Detritic litter cover Rhodolith size and shape
B3 *Posidonia* **CI1**	Habitat extent (km²) Habitat loss (m²) Upper and lower depth limit of meadow (to nearest 0.1m) at monitored sites Extent (km2) and proportion (%) of habitat loss across all monitored sites Change in vertical distribution of habitat (+ or – m) at monitored sites	Extent of habitat loss at assessment area/national level
B3 *Posidonia* **CI2**	For PREI (Gobert et al., 2009): Leaf surface Leaf biomass Shoot density Lower limit depth and type Leaf epiphytes biomass For BiPO (Lopez y Royo et al., 2010) (same parameters as PREI but without sampling living material): Leaf surface Shoot density Lower limit depth and type For functional assessment: Sea urchin density	For EBQI (Personnic et al., 2014): Growth rate of vertical rhizomes Meadow cover Biomass density and species diversity in all compartments: • Filter- and suspension feeder density • Sea urchin *Paracentrotus lividus* density • Related fish assemblage biomass (distinguishing piscivores, carnivores of invertebrates, planktivores) • *Pinna* spp. density (not only *Pinna nobilis* now that *P. rudis* occurrence is increasing)
All sites	Parameters related to water quality (sea temperature, salinity, turbidity, transparency)	

[16] FR: From Ruitton et al. 2014 updated by Astruch et al. (under review). See also: https://www.researchgate.net/publication/325607434_Guide_methodologique_pour_l%27evaluation_ecosystemique_des_habitats_marins.
[17] ES: To estimate this parameter for RMBs, firstly it will be necessary to have the maps of the benthic biocenoses throughout the entire continental shelf. Currently, these maps are only available for certain (few) areas.

Table 3: Overview of the main aspects of monitoring and assessment elements for CI1 and CI2 for the three habitat types Posidonia, coralligenous and maërl

Element	**CI1 & CI2**
Habitat types	Define more clearly each of the habitat types, including specification of which EUNIS/BC subtypes are to be considered, and the most important pressures they face
Monitoring scale: number of sites	A minimum of five sites per habitat type per assessment area (28 subdivisions of Mediterranean region) Sites to be distributed across countries within each assessment area, and represent a gradient of conditions from impacted to non-impacted locations Assess state of habitats (extent and condition) at monitoring sites as a proxy for their state across the wider assessment areas and region (to make monitoring and assessment process feasible for all Contracting Parties)
Monitoring methods: parameters	Refer to Table 2 for minimum and optimal set of parameters per habitat type.
State/impact monitoring in context of pressures	Sites selected for detailed monitoring should include a range of pressures or intensities of pressures, as well as sites which are 'unimpacted'. Pressures (and related activities) should be reported at monitoring sites and across each country (linked to EO6), assigning data to a standardised grid system.
Assessment scale	Use same set of assessment areas (28 subdivisions of the 4 Mediterranean subregions) as proposed for EO6.
Assessment methods	Use several indicators to represent differing aspects of habitat distribution and extent (CI1) and structure and function (CI2), as given in Table 2. The indicators need testing with data from multiple CPs to help define suitable thresholds and ensure comparability of results across the region.
Data standards	Simplify data standards to facilitate data submission and aggregation for analyses.
Baselines	Use unimpacted sites to establish the current extent and state of each habitat type in reference state (under prevailing physiographic, geographic, climatic and environmental conditions).
Quality threshold	Re-evaluate threshold once sufficient data are available to set fully meaningful threshold for the assessment area/subregion and habitat type. Ensure equivalent level of quality across assessment areas, habitats, indicators and pressures.
Extent thresholds	Set thresholds for the maximum extent of habitat loss (for CI1) and habitat which is adversely affected (for CI2) that is permitted per habitat in each assessment area.
Progress with monitoring and assessment processes	Contracting Parties should update their monitoring programmes, if necessary, based on general agreements for monitoring and assessment elements. SPA/RAC should evaluate progress in implementation of the monitoring programmes, say at a mid-point in the 6-year data collection phase. This evaluation should include the state of data submissions to the IMAP Info System and undertaking a trial region-wide assessment. Outcomes should guide further implementation of the programmes in the lead up to the next MED QSR assessment.

PART III: Assessment Criteria and Thresholds for Biodiversity Common Indicators 3, 4 and 5 related to Marine Mammals

Table 4: Biodiversity common indicators 3, 4 and 5 related to Marine Mammals (Ecological Objectives, GES Definitions and Targets, Monitoring and Assessment Scales, Assessment Criteria, Threshold and Baseline Values) (Extracted from UNEP/MED WG.514/Inf.11[18])

Common Indicator 3 (CI3)[19]					
Refining scales of <u>monitoring</u>, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.		**Developing scales of assessment (if different from those of monitoring) and assessment criteria**		**Develop threshold and baseline values**	
Species/functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposed changes***	***Existing context***	***Proposals***
Fin whale / Mysticetes	**<u>Primary monitoring</u>** • *Geographic scale*: Regional. • *Method*: standard & synchronised between all countries (i.e. ASI-like). • *Frequency*: at least once per reporting period. **<u>Secondary monitoring</u>** • *Geographic scale*: Sub-Regional / National. o **High Priority sub-regions** (HP): in WM and I&CM key habitats for this species (i.e. feeding, corridor). o **Low priority sub-regions** (LP) in A and A&LS. • **Method**: o in **HP**: systematic regular monitoring (including photo-id). o in **LP** complement systematic monitoring with other adequate and standard method (UNEP MAP 2019). • **Frequency**: o in **HP** sub-regions the minimum requirement is at least three times (better annually in selected places); o in **LP** at least one time over the reporting period.	New proposal in UNEP/MED WG.450/3: • Regional: large cetaceans	• Primary assessment/MRU: Regional. • Frequency: once every reporting period.	None	**Reference values distributional range**: • <u>*Mediterranean cetaceans* **(all species)**</u>: map to be created based on Mannocci et al. 2018, Canadas et al. 2018 (*Ziphius*) • <u>*Adriatic cetaceans*</u>: Fortuna et al. 2018 (*Tusiops, Stenella*) • <u>*Monk seals*</u>: map to be created based all existing data. **Thresholds for distributional range**: • The extent of the distribution of each species remains stable or expanding compared to a **reference map** (see above). In particular, the Extent of occurrence (EOO) shows: 1) no decline (in all sub-regions where the species was regularly found since last assessment, 2) no decline of number of locations or local putative populations for the species within its distributional range. Given the difficulty to assess the distribution of cetacean species at a finer scale, both reference values and thresholds for this CI should be revised at each assessment cycle.
Sperm whale / Odontocete (deep feeder)	**<u>Primary monitoring</u>** • **Geographic scale**: Regional. • **Method**: As in previous cell. • **Frequency**: As in previous cell. **<u>Secondary monitoring</u>** • **Geographic scale**: Sub-Regional / National. o **High Priority** (HP) in WM, I&CM and A&LS key habitats for this species (i.e. breeding, corridor). o **Low priority** (LP) in A • **Method**: As in "Fin whale" cell. • **Frequency**: As in "Fin whale" cell.			None	
Cuvier's beaked whale (deep feeder)	**<u>Primary monitoring</u>** • **Geographic scale**: Regional. • **Method**: As in "Fin whale" cell. • **Frequency**: As in "Fin whale" cell. **<u>Secondary monitoring</u>** **Geographic scale**: Sub-Regional / National. o **High Priority** (HP) in WM, I&CM and A&LS key habitats for this species (i.e. feeding). o **Low priority** (LP) in A • **Method**: As in "Fin whale" cell. • **Frequency**: As in "Fin whale" cell.			None	

Key: MS=Monitoring Scale, AS=Assessment Scale, MRU=Marine Reporting Units

[18] 8th Meeting of the Ecosystem Approach Coordination Group (EcAp CG), Videoconference, 9 September 2021.
[19] https://www.medqsr.org/common-indicator-3-species-distributional-range-marine-mammals

Common Indicator 3 (CI3)							
Refining scales of monitoring, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.		**Developing scales of assessment and assessment criteria**		**Develop threshold and baseline values**	
Species/ functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposed changes***	***Existing context***	***Proposals***
Long finned pilot whale (epipelagic feeder)	**Primary monitoring** • **Geographic scale**: Regional. • **Method**: standard & synchronised between all countries (i.e. ASI-like). • **Frequency**: at least once per reporting period. **Secondary monitoring** • **Geographic scale**: Sub-Regional / National. ○ **High Priority sub-regions** (HP) in WM key habitats for this species (i.e. feeding, corridor). ○ **Low priority** (LP) in I&CM. • **Method**: ○ in **HP**: systematic regular monitoring; ○ in **LP** complement systematic monitoring with other adequate and standard method (UNEP MAP 2019). • **Frequency**: ○ in **HP** sub-regions the minimum requirement is biannual; ○ in **LP** at least one time over the reporting period.	New proposal in UNEP/MED WG.450/3: • Sub-regional: small cetaceans	• **Primary assessment/MRU**: Regional. • **Frequency: once every reporting period.**	None	*See previous page.*
Risso's dolphin (epipelagic feeder)	**Primary monitoring** • **Geographic scale**: Regional. • **Method**: As in previous cell. • **Frequency**: As in previous cell. **Secondary monitoring** • **Geographic scale**: Sub-Regional / National. ○ **High Priority sub-regions** (HP) in WM & A key habitats for this species (i.e. feeding, corridor). ○ **Low priority** (LP) in I&CM and A&LS. • **Method**: As in "Fin whale" cell. • **Frequency**: As in "Fin whale" cell.			None	
Bottlenose dolphin (epipelagic feeder)	**Primary monitoring** • **Geographic scale**: Regional. • **Method**: As in previous cell. • **Frequency**: As in previous cell. **Secondary monitoring** • **Geographic scale**: Sub-Regional / National. ○ **High Priority sub-regions** (HP) in key habitats for this species in all sub- regions (i.e. feeding, corridor). ○ **Low priority** (LP) in offshore areas. • **Method**: As in "Fin whale" cell. • **Frequency**: As in "Fin whale" cell.			None	
Common dolphin (epipelagic feeder)	**Primary monitoring** • **Geographic scale**: Regional. • **Method**: As in previous cell. • **Frequency**: As in previous cell. **Secondary monitoring** • **Geographic scale**: Sub-Regional / National. ○ **High Priority sub-regions** (HP) in WM, A&LS key habitats for this species (i.e. feeding, corridor). ○ **Low priority** (LP) in A, I&CM. • **Method**: As in "Fin whale" cell. • **Frequency**: As in "Fin whale" cell.			None	
Striped dolphin (epipelagic feeder)	**Primary monitoring** • **Geographic scale**: Regional. • **Method**: As in "Fin whale" cell (except for photo-id). • **Frequency**: As in "Fin whale" cell.			None	

Common Indicator 3 (CI3)					
Refining scales of <u>monitoring</u>, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.		**Developing scales of assessment and assessment criteria**		**Develop threshold and baseline values**	
Species/ functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposed changes***	***Existing context***	***Proposals***
Monk Seal	<u>**Primary monitoring**</u> • **Geographic scale**: Sub-regional o In Group A countries: o Specifically, monitor populations in sites consistent with the Regional Strategy for the conservation of Monk seal in the Mediterranean (RSMS). o In Group B and C countries: area with suitable habitat and/ historical presence. • **Method**: o In Group A countries: ▪ Registry on opportunistic ▪ sightings / citizen science Photo traps in selected caves o In Group B & C countries: ▪ Registry on opportunistic sightings ▪ (minimum requirement) Photo traps in selected caves of selected locations identified by the revised RSMS. • **Frequency**: Annual (minimum requirement) or all known locations in each Group A country covered at least three times (biannually) per reporting period.	None	• **Primary assessment/MRU**: Regional. • **Frequency**: once every reporting period.	None	**Reference values distributional range**: • <u>*Monk seals*</u>: map to be created based all existing data.

Key: MS=Monitoring Scale, AS=Assessment Scale, MRU=Marine Reporting Units

Common Indicator 4 (CI4)					
Refining scales of <u>monitoring</u>, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.		**Developing scales of assessment and assessment criteria**		**Develop threshold and baseline values**	
Species/functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposals***	***Existing context***	***Proposals***

Fin whale	**<u>Primary monitoring</u>**
	• *Geographic scale*: Regional.
	• *Method*: standard & synchronised between all countries (i.e. ASI-like).
	• *Frequency*: at least once per reporting period.
	<u>Secondary monitoring</u>
	• *Geographic scale*: Sub-Regional / National.
	  o *High Priority sub-regions* (HP): in WM and I&.
	  o *Low priority* (LP):in A and A&LS.
	• **Method**:
	  o in HP: systematic regular monitoring (including photo-id);
	  o in LP complement systematic monitoring with other adequate and standard method (UNEP MAP 2019).
	• **Frequency**:
	  o in HP sub-regions the minimum requirement is biennial.
	  o in LP at least one time over the reporting period.
		IMAP Monitoring Protocols 2019	• **Assessment / MRU**: Regional.
			
			• **Frequency: once every reporting period.**
				None	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels.
					• When listed as LC, no decrease of ≥20% over 3 generations (1.5% within a 6-year reporting period).
					• Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details).

Sperm whale	**<u>Primary monitoring</u>**: As in “Fin whale” cell.
	<u>Secondary monitoring</u>:
	• *Geographic scale*: Sub-Regional / National.
	  o HP: in WM, I&CM and A&LS.
	  o LP: in A.
	• *Method*: As in “Fin whale” cell.
	• *Frequency*: As in “Fin whale” cell.
		None.		None.	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels.
					• When listed as LC, no decrease of ≥20% over 3 generations (1.3% within a 6-year reporting period).
					• Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details).

Cuvier’s beaked whale	**<u>Primary monitoring</u>**: As in “Fin whale” cell.
	<u>Secondary monitoring</u>
	• *Geographic scale*: Sub-Regional / National.
	  o HP in WM, I&CM and A&.
	  o LP in A.
	• *Method*: As in “Fin whale” cell.
	• *Frequency*: As in “Fin whale” cell.
		None.		None.	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels.
					• When listed as LC, no decrease of ≥ 1.5% within a 6-year reporting period.
					• Regional reference value: Canadas *et al.* 2018 & ASI 2018 DS design-based estimate (see Box 4 for details).

Long finned pilot whale	**<u>Primary monitoring</u>**: As in “Fin whale” cell.
	<u>Secondary monitoring</u>
	• *Geographic scale*: Sub-Regional / National.
	  o **High Priority sub-regions** (HP) in WM.
	  o **Low priority** (LP) in I&CM.
	• **Method**: As in “Fin whale” cell.
	  o **Frequency**: As in “Fin whale” cell.
		None.		None.	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels.
					• When listed as LC, no decrease of ≥20% over 3 generations (1.7% within a reporting period).
					• Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details).

Risso's dolphin	**<u>Primary monitoring</u>**: As in "Fin whale" cell. **<u>Secondary monitoring</u>** • **Geographic scale**: Sub-Regional / National. ○ **High Priority sub-regions** (HP) in WM & A. ○ **Low priority** (LP) in I&CM and A&LS. • **Method**: As in "Fin whale" cell. • **Frequency**: As in "Fin whale" cell.	None.		None.	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels. • When listed as LC, no decrease of ≥20% over 3 generations (2.0% within a reporting period). • Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details).

Key: MS=Monitoring Scale, AS=Assessment Scale, MRU=Marine Reporting Units

Common Indicator 4 (CI4)					
STEP 1 **Refining scales of <u>monitoring</u>, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.**		**STEP 2** **Developing scales of assessment and assessment criteria**		**STEP 3** **Develop threshold and baseline values**	
Species/functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposals***	***Existing context***	***Proposals***

Bottlenose dolphin	**<u>Primary monitoring</u>**: As in "Fin whale" cell.
	<u>Secondary monitoring</u>
	• **Geographic scale**: Sub-Regional / National.
	  ○ **High Priority sub-regions** (HP).
	  ○ **Low priority** (LP) in offshore areas.
	• **Method**: As in "Fin whale" cell.
	• **Frequency**: As in "Fin whale" cell.
		None.		None.	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels.
					• No decrease of ≥20% over 3 generations (1.9% within a reporting period).
					• Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details).
					  ○ Adriatic: Reference value (2010: Fortuna et al. 2018)

Common dolphin	**<u>Primary monitoring</u>**: As in "Fin whale" cell.
	<u>Secondary monitoring</u>
	• **Geographic scale**: Sub-Regional / National.
	  ○ **High Priority sub-regions** (HP) in WM, A&LS key habitats for this species (i.e. feeding, corridor).
	  ○ **Low priority** (LP) in A, I&CM.
	• **Method**: As in "Fin whale" cell.
	• **Frequency**: As in "Fin whale" cell.
		None.		None.	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels.
					• When listed as LC, no decrease of ≥20% over 3 generations (2.7% within a reporting period).
					• Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details).

Striped dolphin	**<u>Primary monitoring</u>**: As in "Fin whale" cell.	None.		None.	• Check IUCN status and if EN, CR, VU then > only. • Maintain total abundance at or above reference levels. • When listed as LC, no decrease of ≥20% over 3 generations (1.8% within a reporting period). • Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details).

Monk Seal	**<u>Primary monitoring (pending definition of a single standardized method to avoid double counting and allow inter-regional comparison)</u>**
	• **Geographic scale**: Sub-regional
	• **Method**:
	  ○ Group A countries:
	    ▪ Individuals counts based on cave monitoring (minimum requirement) and/or mark-recapture based on photo-identified seals data in sites consistent with the revised Monk seal strategy.
	  ○ Group B & C countries:
	    ▪ Photo-identification of individuals based on images obtained from non-invasive monitoring of resting caves. Caves in sites that require monitoring should be decided based on evidence of recurrent sightings recorded through the results of the opportunistic sighting registry
	  ○ **Frequency**: Annual.
		None.	• **Assessment/ MRU**: Regional	None.	• Increase on total population of 1% over six-year reporting period AND increase in number of pups compared to the last assessment.
					• Provisional reference value: to be estimated.

Key: MS=Monitoring Scale, AS=Assessment Scale, MRU=Marine Reporting Units

Common Indicator 5 (CI5)					
Refining scales of <u>monitoring</u>, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.		**Developing scales of assessment and assessment criteria**		**Develop threshold and baseline values**	
Species/ functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposals***	***Existing context***	***Proposals***
Cetaceans (*Stenella*, *Tursiops* and *Balaenoptera* as proxy for functional groups)	**<u>Primary monitoring</u>** • **Geographic scale**: Sub-regional / National. • **Species**: focus on *Stenella*, *Tursiops* and *Balaenoptera*. **Parameters**: ○ adult survival probability, juvenile survival probability; fecundity/breeding productivity/rate; age class distribution; sex ratio; population growth rate. • **Method**: ○ **Stranding network** collecting standard measures and biological material (e.g., teeth and reproductive organs) ○ **Photo-ID network** collecting standard pictures (list of parameters including calf) • **Frequency**: continuous for strandings', regularly and frequent for photo-ID. **<u>Secondary monitoring</u>** • **Geographic scale**: Sub-Regional. • **Method**: one dedicated concerted and cooperative campaign collecting biopsies (for sex ratio, and hormones rates). • **Frequency**: at least once per reporting period.		• **Assessment/ MRU**: Sub-regional & all "local populations" (long-term studies). • **Frequency**: once per reporting period.		It is not possible to develop reference and threshold values at this point.
Monk seal	**<u>Primary monitoring</u>** • **Geographic scale**: Sub-regional in countries Group A. • **Method**: Pup counts in critical/selected breeding caves (minimum requirement). • **Frequency**: annual.		• **Assessment/MRU**: Sub-regional & all "colonies". • **Frequency**: once per reporting period.		**Reference values demography**: • *<u>Total annual national pup counts</u>*: to be estimated. • *<u>Annual birth rate</u>*: define index areas and produce estimates. **Threshold values**: • Increase from last assessment.

Key: MS=Monitoring Scale, AS=Assessment Scale, MRU=Marine Reporting Units

CI12: Bycatch of vulnerable and non-target species (EO1 and EO3)					
Refining scales of monitoring, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.		**Developing scales of assessment and assessment criteria**		**Develop threshold and baseline values**	
Species/ functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposals***	***Existing context***	***Proposals***
Marine mammals	• In each GFCM GSA, at least one year of cetacean bycatch rate monitoring per each high priority fishing métiers (to be defined), within each reporting cycle. • GFCM provides data on fishing effort during reference year for priority fishing métiers, for each GSA. • **Annually**: bycatch (onboard observations, questionnaires and strandings) and systemic pollution (strandings) • CPs monitor their fleets (**at least one métier per sub-region per year, rotating**). • National stranding network collect data on fishery-induced mortality and level of pollutants in marine mammal tissues. They provide biennial reports on these matters. • Each CP: national monitoring schemes to provide bycatch rates and annual fishing effort.		• **Assessment /MRU**: Regional & Sub-regional (or aggregated GFCM GSAs). • **Frequency**: annual or biennial.		• **Regional**: BRA on each species for the potentially most dangerous fishing gears. ○ Threshold of the total estimated bycatch per all fishing gears: **1% of the total population**. This triggers in-depth monitoring programmes. • **Sub-regional**: ***thresholds*** calculated with CLA or RLA on each species, based on actual observations on bycatch rates, total fishing effort, biological parameters and conservation objectives (CLA = 72% K; RLA = 80% K).

Key: MS=Monitoring Scale, AS=Assessment Scale, MRU=Marine Reporting Units

PART IV Assessment Criteria, Thresholds and Baseline Values for the IMAP Common Indicators 3, 4 and 5 related to Marine Turtles

Table 5. Summary Tables of the methodological approach and results of the analysis on monitoring and assessment scales, assessment criteria and thresholds and baseline values for the Common Indicators 3,4 and 5 related to sea turtles

Common Indicator 3 (CI3)							
STEP 1 **Refining scales of monitoring, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.**		**STEP 2** **Developing scales of assessment**		**STEP 3** **Developing assessment criteria**		**STEP 4** **Develop threshold and baseline values**	
Existing context	**Proposed changes**	**Existing context**	**Proposals**	**Existing context**	**Proposals**	**Existing context**	**Proposals**
Species distribution ranges[20] can be gauged at local (i.e., within a small area like a national park) or regional (i.e., across the entire Mediterranean basin) scales using a variety of approaches. Long- term monitoring of these areas provides information on the temporal evolution in species distributions.	Revise mapping requirements to two maps; one for nesting areas and one for marine areas. Nesting areas monitoring • Geographic scale: o (sub-)National. Up to 7 established sites or 75% of national nesting activity (index areas) • Method: o standard nesting beach surveys. • Frequency: o Minimum = June/July annually for index areas. o six-yearly national scale. Nearshore monitoring • Geographic scale: o (sub-)National. Up to 4 sites. • Method: o systematic regular monitoring index areas. o bycatch/stranding data. • Frequency: o biannual monitoring index areas. o year-round bycatch/stranding recording. o six-yearly national scale. Offshore monitoring • Geographic scale: o (sub-)National/regional. • Method: o Aerial surveys o Boat surveys o Bycatch recording. o Opportunistic boat surveying. • Frequency: o Yearly for aerial and boat surveys o Year-round for bycatch records o *Ad hoc* boat surveying. o six-yearly national scale.	The European (ETRS) 10x10km grid is used for mapping the distribution and range…, Three different maps (grids) are produced yearly for each species accounting for breeding sites, wintering sites and feeding/developmental sites. Number of 10x10 km cells (presence/absence) occupied for breeding or wintering or feeding/developmental areas along the Mediterranean (or subregional) coast and in all pelagic marine areas.	Nesting areas National and Subdivisional level GES assessments based on maintenance of distribution of all nesting sites. Marine areas Subregional GES assessments.	Turtles continue to nest in all known nesting sites. Turtle distribution is not significantly affected by human activities.	Nesting areas Turtles remain present in all parts of annually monitored nesting sites and at all established sites during periodic surveys. Marine areas Turtles remain present in all annually monitored, CP defined, hotspot areas and no evidence of definitive absences in any other area withing the RMU distribution.	None	Nesting areas Baselines centred on 1992 to be used for established nesting sites. More recent data to be modelled to 1992 era levels for these sites. New and emerging sites to use maximum existing 6- year average as baseline. Marine areas All areas assumed to have turtle presence (in line with updated IUCN-MTSG RMU boundaries) unless proven otherwise.

[20] https://www.medqsr.org/common-indicator-3-species-distributional-range-marine-turtles

Common Indicator 4 (CI4)							
STEP 1 **Refining <u>scales of monitoring</u>, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.**		**STEP 2** **Developing <u>scales of assessment</u>**		**STEP 3** **Developing <u>assessment criteria</u>**		**STEP 4** **Develop <u>threshold and baseline values</u>**	
Existing context	**Proposed changes**	**Existing context**	**Proposals**	**Existing context**	**Proposals**	**Existing context**	**Proposals**
For counts carried out on an annual basis, a number of sites should be selected that represent a sufficiently large proportion of the subregional or national population, with criteria being delineated by expert groups. of selected species[21]	<u>Nesting areas monitoring</u> • Geographic scale: ○ (sub-)National. Up to 7 sites or 75% of national nesting activity (index areas) • Method: ○ standard nest count surveys. • Frequency: ○ Minimum = June/July annually for index areas. ○ six-yearly national scale. <u>Nearshore monitoring</u> • Geographic scale: ○ (sub-)National. Up to 4 sites. • Method: ○ systematic regular monitoring index areas. ○ bycatch/stranding data. • Frequency: ○ biannual monitoring index areas. ○ year-round bycatch/stranding recording.	For counts carried out on an annual basis, a number of sites should be selected that represent a sufficiently large proportion of the subregional or national population, with criteria being delineated by expert groups. The "Demography Working Group" suggests that comprehensive surveys should be carried out every 5 years, with the aim of covering all breeding, foraging, wintering and developmental sites. However, here, it is recommended that the whole coastal and marine area is covered on a national or subregional scale to take into account changes in population	<u>Nesting areas</u> National and Subdivisional level GES assessments based on maintenance of nesting abundance at all sites. <u>Marine areas</u> Subregional GES assessments based on relevant population segments present in each area.	<u>Nesting areas</u> The average breeding population size during at least a decade is suggested as the base level (based on International Union for Conservation of Nature Red List minimal criteria for sea turtles) <u>Marine areas</u> for non-breeding animals at wintering / foraging / developmental sites, number of individuals (n) with appropriate modelling to extrapolate population numbers	<u>Nesting areas</u> Rolling average of previous six years' data to count in the annual assessment. To coincide with the six-yearly regionwide GES assessments. <u>Marine areas</u> Rolling average of previous six years' data to count in the annual assessment. To coincide with the six-yearly regionwide GES assessments. Observations on numbers of turtles in different life-stages and sex ratios to be considered	None.	<u>Nesting areas</u> Baselines centred on 1992 to be used for established nesting sites. More recent data to be modelled to 1992 era levels for these sites. New and emerging sites to use maximum existing 6-year average as baseline. <u>Marine areas</u> GES baseline taken as annual abundance derived from existing modelled

[21] https://www.medqsr.org/common-indicator-4-population-abundance-selected-species-marine-reptiles
Cardona L, et al. (2015) Demography of marine turtles nesting in the Mediterranean Sea: a gap analysis and research priorities. Demography Working Group of the 5th Mediterranean Conference on Sea Turtles. 37pp. Bern Convention, T-PVS/Inf (2015) 1
4 Sparks LM & DiMatteo AD (2020) Loggerhead sea turtle density in the Mediterranean Sea. NUWC-NPT Tech Rep 12360. 77pp.

Common Indicator 5 (CI5)							
STEP 1 **Refining scales of monitoring, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.**		**STEP 2** **Developing scales of assessment**		**STEP 3** **Developing assessment criteria**		**STEP 4** **Develop threshold and baseline values**	
Existing context	**Proposed changes**	**Existing context**	**Proposals**	**Existing context**	**Proposals**	**Existing context**	**Proposals**
A number of sites should be selected that represent ***a sufficiently large proportion of the subregional or national population for demographic data to be collected (reflecting the breeding, wintering, foraging and developmental populations that are representative of the region)***[22]. If possible, populations should be selected where animals have been tracked with a sufficient number of units (i.e., >50 individuals), from which the connectivity among these different habitat types can be established.	Nesting areas monitoring • Geographic scale: ○ (sub-)National. Up to 7 established sites or 75% of national nesting levels • Methods: ○ Standard: hatchling emergence success (HES) and nest temperature data. ○ Additional: Sex ratio adults • Frequency: ○ Annually, Minimum: Aug./Sept. er for index area HES and May- September for temperature data. April-May for adult sex ratios. ○ six-yearly national scale. Nearshore monitoring • Geographic scale: ○ (sub-)National. Up to 4 index hotspot sites. • Method: ○ systematic regular monitoring index areas. ○ bycatch/stranding data. • Frequency: ○ biannual monitoring index areas. ○ year-round bycatch/stranding recording. ○ six-yearly national scale. Offshore monitoring • Geographic scale: ○ (sub-)National. • Method: ○ Bycatch recording. ○ Opportunistic boat surveying. • Frequency: ○ Year-round bycatch records ○ *Ad hoc* boat surveying. • ○ six-yearly national scale.	The selected breeding sites should aim to be genetically diverse, so as this diversity can be detected at foraging/ wintering/ developmental grounds where different populations diverge. This will facilitate the selection of marine areas for protection that support the highest genetic diversity (i.e., the greatest accumulation of different breeding populations), as well as those that support single breeding populations, which may be of equal importance. Opportunistic data should be collected from all possible sources, wherever possible, and compiled into a single database, which might be used to provide an overview of the entire area. Knowledge about the sex, health and genetic structure of the different populations/sub-populations will be obtained, by Understanding recruitment and mortality within different parts of a population and across populations. This information is important to understand whether there are sex-specific mortality risks at different age/size classes, which is important towards aiding population recovery. Also, knowledge on the physical health and genetic health of populations will be obtained, which will indicate the capacity for resilience to human activities, including climate change.	Nesting areas National and Subdivisional level GES assessments. Marine areas Subregional GES assessments.	publication). Most studies that do exist are focused on the breeding areas; thus, greater focus is required at foraging, wintering and developmental areas, with in-water limitations needing to be accounted for in analyses. Therefore, set analyses need to be established that are applicable within and/or across the different habitat types to allow comparison at the Mediterranean level.	Nesting areas Maintenance of suitable hatchling sex ratios and high hatchling emergence success. Marine areas Quantification of bycatch and calculation of bycatch mortality rates. Observations on numbers of turtles in different life-stages and sex ratios to be considered for indications of perturbations in population structure.	No threshold and baseline values have been consistently defined and applied to date.	Nesting Areas 'Good' HES values can be taken from published literature and taken as thresholds with a buffer zone for improved conservation measures. Nest temperature records to be monitored with estimations of over 95% female production as an upper threshold. Marine areas Human-induced mortality as a component of longevity and survivorship is the one factor that can be measured and affected by conservation actions and hence can be considered as an actionable indicator for GES. Numbers of deaths should be used as the indicator with a stable or declining trend in numbers indicating GES

[22] https://www.medqsr.org/common-indicator-5-population-demographic-characteristics-marine-reptiles

PART V: Assessment Criteria, Thresholds and Baseline Values for the IMAP Common Indicators 3, 4 and 5 related to Sea Birds

Table 6. Summary Tables of the methodological approach and results of the analysis on monitoring and assessment scales, assessment criteria and thresholds and baseline values for the Common Indicators 3,4 and 5 related to seabirds

	Species	Common Indicator	Assessment Criteria	Baseline	Threshold	Scales of Assessment	Scales of Monitoring
1	Osprey *Pandion haliaetus*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Reference-based baseline: pristine conditions baseline with widest known range in the last 100 years. Modern baseline: If no reliable historic data are available, modern baseline with widest known range in last 20 years	Not more than 10% deviation from baseline	Spatial: Regional and sub-regional Temporal: Annual, with reporting every six years	Spatial: National, surveys covering at least all known breeding areas Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to IMAP reporting cycles
		CI 4: Population abundance	Annual relative breeding bird abundance (annual abundance / baseline abundance)	Reference-based (modern) baseline: Abundance at the start of the implementation of BD (1981) Alternatively: highest breeding abundance estimate in the last 20 years Additionally: Highest abundance of entering population in the last 20 years	Deviation from baseline: annual relative breeding and wintering abundance > 0.7	Spatial: Regional and sub-regional (all sub-regions, but with main focus on Western Mediterranean Sea) Temporal: Aiming at annual assessment with reporting every six years	Spatial: National or sub- national (aiming at 100% of known nesting sites) Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate: Reproductive success of monitored nests Survival rates of adult and young from capture-mark-resighting (colour-ringing of nestlings)	Model-based baseline: growth rates in the last assessment cycle Population	Deviation from growth rate of 1.0 or higher baseline: Population	Spatial: Regional, sub- Temporal: Annual breeding success and survival rates with reporting every 6 years regional and national	Spatial: National or sub-national, aiming at 100% assessment (all known nests) of reproductive success Representative subsample of accessible nests for colour-ringing of nestlings Temporal: Annual for breeding success and survival via reading of colour rings

2	Kentish Plover *Charadrius alexandrinus*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding and wintering populations % Shift in occupancy for breeding and wintering population	Reference-based baseline for breeding and wintering population separately: Widest known range in the last 20 years, except a major and reversible decline in the range is known to have taken place before	Not more than 10% deviation from baseline	Spatial: Sub-regional Temporal: Every six years	Spatial: National Temporal: Annual
		CI 4: Population abundance	For breeding birds: Annual relative breeding bird abundance For non-breeding birds Annual relative wintering bird abundance	Reference-based (modern) baseline: Highest breeding abundance estimates and wintering abundance estimates (separately) in the last 20 years	Deviation from baseline: annual relative breeding and wintering abundance > 0.7	Spatial: Sub-regional Temporal: Every 6 years, linked to IMAP reporting cycle, alternatively every 3 years linked to NE- Atlantic flyway count initiative	Spatial: Breeding population: National or sub-national (at least 40% of the national breeding population and certainly no less than 10% of the national population,) Non-breeding population: sub-national representative number of known sites
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored nests reproductive success Adult survival rates from capture- mark- resighting of monitored nests (colour-ringing of breeding adults) Immature survival rates from capture- mark- resighting (via colour ringing of chicks directly after hatching	Model-based baseline: Population growth rates in the last 6 to 12 years where data is available	Population growth rate to be set close to 1.0 over a 6-year average as requirement to reach GES	Spatial: Sub-regional Temporal: Annual: breeding success from sub-samples Every six years: adult and immature survival	Temporal: Annual Spatial: National or sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies Temporal: Annual: breeding success Every six years: adult and immature survival

3	Mediterranean Shag *Gulosus aristotelis desmarestii*	CI3: Species Distributional Range	Distribution of breeding colonies, and separately, distribution during non-breeding (July roosts)	Reference-based baseline for breeding and non-breeding population separately: Widest known range in the last 20 years, except a major and reversible decline in the range is known to have taken place before	Not more than 10% deviation from baseline, (potentially re- evaluated at higher threshold due to potentially strong fluctuations between years, alternatively: 10% deviation between averages)	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to MSFD reporting cycle
		CI 4: Population abundance	For breeding birds: Annual relative breeding bird abundance For non-breeding birds: Annual relative non-breeding bird abundance	Reference-based (modern) baseline: Highest breeding and non-breeding abundance estimates in the last 20 years	Deviation from baseline: Annual relative breeding and non-breeding abundance > 0.7	Spatial: Regional and sub-regional Temporal: Every six-years	Spatial: Breeding population: National or sub-national (at least 40% of the national breeding population and certainly no less than 10% of the national population) Non-breeding population: sub-national: relevant, representative sites during mid-winter counts Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored nests (alternatively count of fledglings pre- dispersal to reduce disturbance) Adult survival rates from capture-mark- resighting of monitored nests (colour-ringing of breeding adults) Immature survival rates from capture-mark-resighting (via colour ringing of chicks), additionally by ratio adult vs first year birds at roosts (July counts).	Model-based baseline: Population growth rates in the last assessment cycle	Deviation from baseline: Population growth rate of at least 1.0	Spatial: Regional and sub-regional Temporal: Every six year: adult and immature survival Annual: reproductive success	Spatial: National or sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies Relevant, representative sites for mid-winter counts Temporal: Annual

4	Audouin's Gull *Ichthyaetus audouinii*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Maximum range of breeding colonies as measured in the last 20 years, alternatively since implementation of the BD (1981)	Not more than 10% deviation from baseline	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National, surveys covering all known (major) breeding colonies per country Temporal: Annual highly recommended! (where not feasible 1 to 2 times within a 6 years reporting cycle)
		CI 4: Population abundance	For breeding birds in colonies: Annual relative breeding bird abundance For non-breeding birds during coastal mid-winter roost counts and at bottleneck during post-breeding/ post fledging migration (Gibraltar Strait): Annual relative non-breeding bird abundance	Reference-based (modern) baseline: Highest breeding and non-breeding abundance estimates in the last 20 years	Deviation from baseline: annual relative breeding and non-breeding abundance > 0.7	Spatial: Regional and sub-regional Temporal: Annual with reporting every six-years	Spatial: Breeding population: National or sub-national, all (larger) colonies Non-breeding population: sub-national, all known roost sites during mid- winter, bottleneck during outbound migration Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored colonies or subsamples Post-fledging, immature and adult survival rates modelled from capture-mark- resighting of birds colour-ringed as chicks in colonies Ratio of first winter versus adult birds from counts at bottleneck and mid- winter roosts for cross-assessment of reproductive output	Model-based population growth rate	Population growth rate 1.0 or higher	Spatial: Sub-regional Temporal: Annual: breeding success, immature and adult survival rates with reporting every six years	Spatial: National or sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies All-important mid-winter roosts per country for ratio of adult versus 1st winter birds and reading of colour ringed individuals bottleneck (Gibraltar Strait) for ratio of adult versus 1st year during outbound migration Temporal: Annual for breeding success, adult and immature survival

5	Slender- billed Gull *Chroicocephalus genei*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Average range of breeding colonies as measured in the last 20 years, alternatively since implementation of the BD (1980)	Not more than 10% deviation from baseline	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National, surveys covering all known (major) breeding colonies per country Temporal: Annual if feasible, alternatively 1 to 2 times within a 6 years reporting cycle
		CI 4: Population abundance	For breeding birds in colonies: Annual relative breeding bird abundance For non-breeding birds during coastal mid-winter roost counts and at roosting areas during post-breeding. Annual relative non-breeding bird abundance	Reference-based (modern) baseline: Average breeding and non-breeding abundance estimates in the last 20 years	Deviation from baseline: Annual relative breeding and non-breeding abundance > 0.7	Spatial: Regional and sub-regional Temporal: Annual with reporting every six-years	Spatial: Breeding population: National or sub-national, all (larger) colonies Non-breeding population: sub-national, all known roost sites during mid- winter Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored colonies or subsamples Post-fledging, immature and adult survival rates modelled from capture-mark-resighting of birds colour-ringed as chicks in colonies Ratio of first winter versus adult birds from counts at bottleneck and mid-winter roosts for cross-assessment of reproductive output	Model-based population growth rate	Population growth rate 1.0 or higher	Spatial: Sub-regional Temporal: Annual: breeding success, immature and adult survival rates with reporting every six years	Spatial: National or sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies All-important mid-winter roosts per country for ratio of adult versus 1st winter birds and reading of colour ringed individuals Temporal: Annual for breeding success, adult and immature survival

6	Lesser- crested Tern *Thalasseus bengalensis emigratus*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Maximum range of breeding colonies as measured in the last 20 years	Not more than 10% deviation from baseline, set as a preliminary value, potentially to be set lower due to restricted range	Spatial: Sub-regional Temporal: Every six years	Annual for breeding success, adult and immature survival
		CI 4: Population abundance	For breeding birds in colonies: Annual relative breeding bird abundance For non-breeding birds during coastal mid-winter roost counts and at bottleneck during post-breeding/ post fledging migration (Gibraltar Strait) Annual relative non-breeding bird abundance	Reference-based (modern) baseline: Highest breeding and non-breeding abundance estimates in the last 20 years	Deviation from baseline: annual relative breeding and non-breeding abundance > 0.7	Spatial: Regional and sub-regional Temporal: Annual with reporting every six-years	Spatial: Breeding population: National or sub-national, all (larger) colonies Non-breeding population: sub-national, all known roost sites during mid- winter, bottleneck during outbound migration Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored colonies or subsamples Post-fledging, immature and adult survival rates modelled from capture-mark- resighting of birds colour-ringed as chicks in colonies Ratio of first winter versus adult birds from counts at bottleneck and mid- winter roosts for cross-assessment of reproductive output if feasible	Model-based population growth rate	Population growth rate 1.0 or higher	Spatial: Sub-regional, national (Libya) Temporal: Annual: breeding success, immature and adult survival rates with reporting every six years	Spatial: National or sub-national All colonies Representative subsample of nests/ chicks from these sample colonies All mid-winter aggregations per country for ratio of adult versus 1st winter birds and reading of colour ringed individuals bottleneck (Gibraltar Strait) for ratio of adult versus 1st year during outbound migration Temporal: Annual for breeding success, adult and immature survival, alternatively, breeding success every second year to reduce disturbance

7	Sandwich Tern *Thalasseus sandvicensis*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding and wintering birds % Shift in occupancy for breeding and wintering population	Maximum range of breeding colonies as measured in the last 20 years	Not more than 10% deviation from baseline	Spatial: Sub-regional Temporal: Every six years	Spatial: National Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to EcAp reporting cycles
		CI 4: Population abundance	Relative abundance for breeding and wintering birds	Reference-based (modern) baseline: Highest breeding and non-breeding abundance estimates in the last 20 years	Annual relative abundance > 0.7	Sub-regional Annual where feasible, with reporting every six- years	Sub-national: Breeding: high- and low-pressure areas > sample of nests Wintering: selection of high- and low-pressure areas or all known areas Temporal: annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored colonies or subsamples Post-fledging, immature and adult survival rates modelled from capture-mark-resighting of birds colour-ringed as chicks in colonies Ratio of first winter versus adult birds from counts at mid-winter roosts for cross-assessment of reproductive output if feasible	Model-based population growth rate	Population growth rate 1.0 or higher	Spatial: Regional, Sub-regional Temporal: Annual: breeding success, immature and adult survival rates with reporting every six years	Spatial: National or sub-national Temporal: Annual for breeding success, adult and immature survival, alternatively, breeding success every second year to reduce disturbance

8	Mediterranean Storm- petrel *Hydrobates pelagicus melitensis*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Reference-based baseline: Widest known range in the last 20 years, except a major and reversible decline in the range is known to have taken place before	Not more than 10% deviation from baseline	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to EcAp reporting cycles
		CI 4: Population abundance	Annual relative breeding bird abundance	Reference-based (modern) baseline: Highest breeding abundance estimate in the last 20 years	Deviation from baseline: Relative annual abundance > 0.8	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National or sub-national (at least 40% of the national population and certainly no less than 10% of the national population, according to suggestions by UNEP/IMAP (2017)) Temporal: every 3 to 6 years
		CI5: Population Demographic Characteristics	Population growth rate: Adult survival rates from capture-mark-recapture of monitored colonies	Model-based baseline: Average population growth rates if available in the last 6 to 12 years	Average growth rate of at least 1.0	Spatial: Regional and sub-regional Temporal: Aiming at annual monitoring and assessment with reporting every six years	Spatial: National or sub-national, representative subsamples Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies Temporal: Annual

9	Scopoli's Shearwater *Calonectris diomedea*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Reference-based baseline: Widest known range in the last 20 years, except a major and reversible decline in the range is known to have taken place before	Not more than 10% deviation from baseline	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to EcAp reporting cycles
		CI 4: Population abundance	Annual relative breeding bird abundance supported by or substituted with raft counts where deemed suitable, following the confirmation of connectivity of rafts with certain colonies by means of GPS-tracking	Reference-based (modern) baseline: Abundance at the start of the implementation of BD (1980): needs to be discussed Highest breeding abundance estimate in the last 20 years	Deviation from baseline: Relative annual abundance > 0.8	Spatial: Regional or sub-regional Temporal: Aiming at annual monitoring and assessment with reporting every six	Spatial: National or sub-national (at least 40% of the national population and certainly no less than 10% of the national population, according to suggestions by UNEP/IMAP (2017)) Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored nests Adult survival rates from capture-mark-recapture of monitored nests	Model-based approach: Population growth rates over one assessment and reporting cycle	Population growth rate of at least 1.0	Spatial: Regional Temporal: Annual	Spatial: National or sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies Temporal: Annual

10	Yelkouan Shearwater *Puffinus yelkouan*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Reference-based baseline: Widest known range in the last 20 years, except a major and reversible decline in the range is known to have taken place before	Not more than 10% deviation from baseline	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to EcAp reporting cycles
		CI 4: Population abundance	Annual relative breeding bird abundance by combination of methods including CMR in colonies; supported by land-based passage counts in the evening, combined with telemetry were deemed suitable	Reference-based (modern) baseline: Highest breeding abundance estimate in the last 20 years	Deviation from baseline: annual relative breeding abundance > 0.9	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to EcAp reporting cycles
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored nests Adult survival rates from capture-mark-recapture of monitored nests	Model-based approach: Population growth rates over one assessment and reporting cycle	Population growth rate of at least 1.0	Spatial: Regional and sub-regional Temporal: Annual	Spatial: National or sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies Temporal: Annual

11	Balearic Shearwater *Puffinus mauretanicus*	CI3: Species Distributional Range	Distributional pattern: % change in occupancy in distribution range of breeding birds Distributional pattern: % change in at-sea distribution (50% KDE), modelled from representative number of tracked individuals and/or transect line counts % Shift in occupancy	Reference-based 'modern' baseline: Due to unfavorable conservation status (CR): maximum ranges (at sea and regarding breeding colonies) e.g. since start of the implementation of BD (1980)	No negative deviation in range size between assessment cycles due to precarious conservation status. Maximum 10% in range shift between assessment cycles	Spatial: Sub-regional (Balearic islands for breeding, Western Mediterranean Sea (mainly) for at-sea distribution during breeding (relevant OSPAR sub-region during non-breeding) Temporal: Every six years	For breeding range: Balearic Islands, covering at least all known breeding areas Temporal: Annual
		CI 4: Population abundance	Annual relative breeding bird abundance Annual count net maxima of individuals passing bottleneck on migration	Reference-based (modern) baseline: Highest breeding abundance estimate in the last 20 years	Deviation from baseline: annual relative breeding abundance annual relative breeding abundance 1.0 or larger	Spatial: Regional (Western Mediterranean Sea) Temporal: Aiming at annual monitoring and assessment with reporting every six years	Spatial: Sub-national (ideally 100% but at least 90% of the population) Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success Adult survival rates from capture-mark-recapture of monitored nests	Model-based approach: Population growth rates over one assessment and reporting cycle	Population growth rate 1.0 or higher	Spatial: sub-regional Temporal: Annual with reporting every six years	Spatial: Sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies Temporal: Annual

PART VI: Monitoring and Assessment Scales, Assessment Criteria, Thresholds and Baseline Values for the IMAP Common Indicators 6 related to Non-Indigenous Species (NIS)

Assessment Criteria	Assessment criteria for preparing validated check lists of NIS to be used for assessing GES include a) taxa (all taxa or excluding phytoplankton, parasites); b) species to be considered in trends indicator (extinct species, cryptogenic species, crypto-expanding, questionable species); c) pathways to be considered (all pathways or excluding unaided expanding species, e.g. Lessepsian immigrants). Partly native species, NIS introduced through natural dispersal, unicellular marine algae, parasites, extinct and freshwater species should be reported in NIS lists but considered in CI6 assessments on a case-by-case basis.
Spatial and Temporal Scales of Monitoring and Assessment	Broad Geographic Units: Assessment of threshold values based on the trends indicator (CI6) calculated to date can be achieved at the basin and country level, although it is more meaningful to be assessed at the subregional level (i.e. EcAp subregional units) and, accordingly, at the national part of a subregion for each country, e.g. Greece: EMED, CMED, ADRIA; Italy: WMED, CMED, ADRIA, Tunisia: WMED, CMED. Broad Temporal Scales: For consistency and harmonization reasons, it is recommended that the assessment period of CI6 should be the same across all Mediterranean countries and follow the assessment and reporting 6-year periods already established for EU countries under the MSFD.
Finer scales for NIS monitoring	At basin scale, there are no established standard protocols for the monitoring of NIS. However, guidelines for monitoring NIS in the Mediterranean were developed and endorsed by the CPs to the Barcelona Convention in 2019 under the framework of the EcAp/IMAP (UNEP/MED WG.467/16 (2019) “Monitoring Protocols for IMAP Common Indicators related to Biodiversity and Non-Indigenous species”). The majority of countries do not have a dedicated strategy but have a monitoring strategy including marine NIS applied either at hot-spot areas of the country (i.e. ports, aquaculture units, marine protected areas) or in specific subregions through a related network of sampling stations. Targets of NIS monitoring include mainly the detection of new NIS and the measurement of abundance/coverage/biomass of established and/or invasive NIS, while only a small number of countries monitor the impact of established/invasive NIS on the native communities. The IMAP Common Indicator Guidance propose more intense monitoring effort at “hot-spots” and “steppingstone areas” for non-indigenous species introductions, e.g. sampling at least once a year at ports and their wider area and once every two years in smaller harbours, marinas, and aquaculture sites. Importantly, the same sites should be surveyed each monitoring period, to avoid biases potentially caused by differences among sites.
Threshold Values	Currently, threshold values for the number of new introductions of non-indigenous species have not been set neither at the EU or the Mediterranean level. Ongoing work in the framework of the MSFD (Tsiamis et al., 2021b) has concluded that the most suitable approach for setting threshold values for D2C1 is to adopt the percentage reduction of new NIS and the exact value of percentage reduction should be decided at regional and/or subregional scale, based on the pathways pressure and level of monitoring coverage of each region/subregion. Preliminary analysis of the available data for the Mediterranean between 1970-2017 for the purposes of this report demonstrated that there is a significant increase in the rate of new NIS entering all EcAp subregions after 2000 (presumably as a result of increased scientific effort) and that this parameter is significantly different between EcAp subregions. Consequently, the initial recommendations are that i) the threshold values for CI6 in the Mediterranean need to be set at subregional level and not at regional level and ii) we need to consider data only after 2000s in order to establish today's threshold values. Furthermore, for Mediterranean region/subregions that have not been efficiently monitored in terms of NIS

	during the previous decades, a shorter time span of 6-years cycle periods should be preferred, e.g. 3 years. Conclusively, threshold values should be established separately for each of the Mediterranean subregions and should be sought by examining the data of the last two decades, if not an even more recent time period. At the same time, a consensus needs to be reached about which species groups will be included in the calculations and how their environmental impact will be taken into account. These are decisions that will determine the definition of GES for EO2 and will affect the management obligations of Contracting Parties to the Barcelona Convention. As such, it is proposed that further work takes into account the contribution of regional experts not only from the fields of taxonomy, monitoring and assessment but also conservation and management and last, but not least, ecologists with strong statistical/mathematical background
Baseline	The regional baseline (i.e., UNEP/MED WG.521/Inf.8) includes only validated species records observed up to the end of 2020, harmonizing regional and subregional inventories and updating national lists (including the JRC baselines for EU Mediterranean countries). A total of 1,011 non-indigenous species (NIS) have been recorded in Mediterranean marine waters, of which 748 are considered established—an overall establishment rate of nearly 74%, varying by subregion. These include 144 Macrophytes, 224 Mollusca, 188 Arthropoda, 203 Chordata, 83 Annelida, 33 Bryozoa, 42 Cnidaria, 47 Foraminifera, and 47 other taxa. Alien status and record validity have been clarified for most species. Where information was lacking, data-deficient and questionable records were compiled at regional and subregional levels.

Annex II

IMAP Assessment Criteria for Nutrients, Contaminants and Marine Litter[23]

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

Annex II: 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 14[24]

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
σt (density)	<25	25<d<27	>27	>27	All ranges
S (salinity)	<34.5	34.5<S<37.5	>37.5	>37.5	All ranges

Note: With the view to assess eutrophication, the classification scheme on Chl a concentration (in µg/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-region[25].
(Reference conditions and boundary (Good/Moderate status) values, expressed as G_mean annual values, are based on long time series (>5 years) of monthly sampling at least, which differ from type to type on the sub-regional scale, and therefore, were built with different strategies).

	Coastal waters					
	Reference conditions of *c*(Chl*a*) (µg/L)		**Boundaries of *c*(Chla) (µg/L) for G/M status**		**Reference conditions of *c*(TP) (µmol/L)**	**Boundaries of *c*(TP) (µmol/L) for G/M status**
Water Typology	*G_mean*	90% percentile	*G_mean*	90% percentile		
Type I	1.19[22]	3.33[b]	4.1[22]	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[26]	1.9	1.48[22]	3.50[27]	-	-
Type II-A Adriatic	0.33	0.87	1.5	4.0	0.16 [a]	0.48 [a]
Type II-A[e] Tyrrhenian	0.32	0.77	1.2	2.9	-	-
Type III-W Adriatic[c]	-	-	0.64[f]	1.7[f]	-	0.26
Type III-W Tyrrhenian	-	-	0.48	1.17	-	-
Type III-W-FR-SP	0.37[22]	0.9	0.74[f22]	1.89[28]	-	-
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 *c*(Chl*a*) (µg/L)**	**Boundaries of *c*(Chl*a*) (µg/L) for G/M status**	**Reference conditions of *c*(DIN) (µmol/L)**	**Boundaries of *c*(DIN) (µmol/L) for G/M status**

[24] 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.
[25] The new values are calculated based on data as available by December 2022.
[26] Gmean values corresponding to the reference and boundary values of Chla (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.
[27] 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.
[28] 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.

	G_mean	90 % percentile	*G_mean*	90 % percentile		
Type I Adriatic	0.15[g]; 0.29[h]	0.42[f]; 0.81[g]	3.1	8.7	0.21[g]; 0.66[h]	22.3
Type II-A Adriatic	0.11	0.29	-	-	-	-
Type III-W Adriatic [c]	-	-	0.64	1.7	-	-

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

2. The assessment criteria for IMAP Common Indicator 17[29][30]

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)					
	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.*					

[29] For ease of reference, the Secretariat included the values as approved by Decisions IG.22/7 0F (COP 19) and IG. 23/6 (COP 20) which are shown in shaded cells.
[30] The new values are calculated based on data as available by December 2022.

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					
	The BC values in sediments, µg/kg dry wt				
PAH compounds	MED	WMS	ADR	CEN	AEL
Naphthalene	2.00	8.0	2.0	#	2.3
Acenaphthylene	(1.0)#	#	#	0.4	#
Acenaphthene	(2.0)#	#	#	*	#
Fluorene	(2.0)#	#	#	0.4	#
Phenanthrene	3.10	14.9	3.5	0.8	3.1
Anthracene	(2.2)#	#	#	#	#
Fluoranthene	5.00	#	7.0	0.1	2.7
Pyrene	6.20	24.8	8.0	0.4	3.0
Benzo[a]anthracene	3.38	19.7	4.1	*	1.8
Chrysene	2.70	35.9	4.6	1.6	1.6
Benzo(b)fluoranthene	5.00	8.7	15.0	*	2.6
Benzo(k)fluoranthene	4.00	#	3.0	*	#
Benzo[a]pyrene	(4.0)#	#	4.0	#	1.0
Benzo[g,h,i]perylene	(4.2)#	#	5.7	*	1.8
Dibenz[a,h]anthracene	(1.0)#	7.0	#	*	#
Indeno[1,2,3-c,d]pyrene	(4.0)#	#	4.4	*	2.1
Sum PAHs	27.4	160	41.0	6.3	21.4
	The BAC values 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 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 (*M. galloprovincialis*), 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 *(Mullus barbatus*), 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 (*M. galloprovincialis),* 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[31]	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;*

[31] 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 (*M. galloprovincialis*)					
SEDIMENTS, µg/kg dry wt	MED	WMS	ADR	CEN	AEL
PCBs					
PCB28	0.10	#	#	#	0.09
PCB52	0.07	0.10	0.09	#	0.04
PCB101	0.10	0.16	0.16	*	#
PCB118	0.10	0.46	0.18	#	0.01
PCB138	0.11	0.26	0.24	#	#
PCB153	0.14	0.40	0.28	#	0.02
PCB180	0.09	0.13	0.13	#	#
Sum 7 PCBs	0.40	1.60	0.21	#	0.19
Pesticides					
γ-HCH (Lindane)	$(0.1)^{\#}$	#	#	*	0.02
DDE(p,p’)	$(0.1)^{\#}$	0.23	#	#	*
Hexachlorobenzene	$(0.1)^{\#}$	#	#	#	*
Dieldrin	$(0)^{\#}$		#	#	#
BIOTA – MG, µg/kg dry wt	MED	WMS	ADR	CEN	AEL
PCBs					
PCB28	0.20	0.07	1.38	*	*
PCB52	0.38	0.3	0.5	*	*
PCB101	1.20	1.1	1.4	*	*
PCB118	1.23	1.5	1.4	*	*
PCB138	2.31	2.4	3.3	*	*
PCB153	3.45	4.6	4.6	*	*
PCB180	0.50	0.3	0.5	*	*
Sum 7 PCBs	18.4	28.6	17.3	*	*
Pesticides					
γ-HCH (Lindane)	$(1.0)^{\#}$	#	#	*	*
DDE(p,p’)	3.05	3.05	*	*	*
Hexachlorobenzene	$(0.5)^{\#}$	#	#	*	*
Dieldrin	$(1.0)^{\#}$	#	*	*	*

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

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

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

Table 10. The Mediterranean EAC values 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 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) values for IMAP CI 18[32]

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

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

[32] 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.

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

Table 12. 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 Directives1881/2006 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			
	TM, mg/kg wet wt		
matrix	**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 13. 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) 1881/200.6. 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)fluorantheneand chrysene) - EC Regulation (EC) 1881/2006 and amendments 835/2011 and 1259/2011		
Matrix	**Maximum levels (µg kg^{-1} wet wt)**	
	Benzo(a) pyrene	**Sum of Benzo(a) pyrene, Benzo(a) anthracene, Benzo(a) fluoranthene and chrysene**
Smoked fish muscle	2-5	12-30
Smoked bivalve mollusc	6	35
Bivalve mollusk (fresh, chilled or frozen)	5	30

Table 14. 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.

PART II: Marine Litter (IMAP – EO10)[33]

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 24[34]

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 Indicator24: Ingestion	0.07 gr dry weight ML ingested[35]	0.01 gr dry weight ML ingested
Common Indicator24: Entanglement	35% affected sample	9% affected sample

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%

[33] Threshold Values (TV) for IMAP EO10 (Marine Litter) are subject to update for the third iteration of the MED QSR.
[34] 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.

Appendix 3

Updated Guidance Factsheets for IMAP 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:

a) **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.

b) **Preparation of National IMAPs** and lessons learned during their initial implementation phase.

c) **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.

d) **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.

e) **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 bellow.

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.		
Scientific references		

[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.

Indicator Title	Common Indicator 13. Concentration of key nutrients in water column (EO5)

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Berg, T., Murray, C., Carstensen, J., and Andersen, J. H. (2017). NEAT – Nested Environmental Status Assessment Tool - Manual Version 1.3. DEVOTES project.

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Indicator Title	Common Indicator 13. Concentration of key nutrients in water column (EO5)

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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 physic-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 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

Indicator Title	Common Indicator 13. Concentration of key nutrients in water column (EO5)

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.

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.

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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.

Indicator Title	Common Indicator 13. Concentration of key nutrients in water column (EO5)

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.

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:

Nítrate (NO_3-N)

Nitrite (NO_2-N)

Ammonium (NH_4-N)

Total Nitrogen (TN)

Orthophosphate (PO_4-P)

Total Phosphorus (TP)

Orthosilicate (SiO_4-Si)

Sub-Indicators: Nutrient ratios (molar) of silica, nitrogen and phosphorus where appropriate:

Indicator Title	Common Indicator 13. Concentration of key nutrients in water column (EO5)

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.

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.

Indicator Title	Common Indicator 13. Concentration of key nutrients in water column (EO5)
Methodology for monitoring, temporal and spatial scope	

Available methodologies for monitoring and monitoring protocols

Traditional methods for eutrophication monitoring in coastal waters involve *in situ* sampling/measurements of commonly measured parameters such as nutrients concentration. Concerning available methods for *in situ* 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 *in vitro* 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 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

Indicator Title	Common Indicator 13. Concentration of key nutrients in water column (EO5)

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.

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.

Indicator Title	Common Indicator 13. Concentration of key nutrients in water column (EO5)

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(α/2; N1+N2-2) * √2; N1+N2-2) 0
For Chl-a log10 units for different sample size N with the significance level: α/2 = 0,025; with an average sd = 0.30

N = 12 t = 2.074 √
N = 24 t = 2.013 √ = 24 = 0.289 dM > |0.17|
N = 52 t = 1,983 √ = 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 chla 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.

Reference conditions and boundary (Good/Moderate status) values are based on long time series (>5 years) of monthly sampling at least.

	Coastal waters	
	Reference conditions of *c*(TP) (µmol/L)	**Boundaries of *c*(TP) (µmol/L) for G/M status**
Water Typology		
Type I		

Indicator Title	Common Indicator 13. Concentration of key nutrients in water column (EO5)

Type I Adriatic	0,19 [a]	0,55 [a]
Type II-A-FR-SP[d]	-	-
Type II-A Adriatic	0,16 [a]	0,48 [a]
Type II-A[e] Tyrrhenian	-	-
Type III-W Adriatic[c]	-	0,26
Type III-W Tyrrhenian	-	-
Type III-W-FR-SP		
Type III-E		
Type Island-W		

	Open (offshore) waters in the Adriatic Sea Sub-region	
	Reference conditions of *c*(DIN) (µmol/L)	**Boundaries of *c*(DIN) (µmol/L) for G/M status**
Water Typology		
Type I Adriatic	0,21[g]; 0,66[h]	22.3
Type II-A Adriatic	-	-
Type III-W Adriatic [c]	-	-

[a] From Giovanardi et al, 2018
[c] The ecological classification scheme would not be suitable for proper and safe classification, and therefore the boundary values for WT III-W Adriatic waters are based on the H/G values for WT II-A Adriatic in coastal waters i.e. 0.64 µg/L for Chla and 0,26 µmol/L for TP
[d] Correction of error included to ensure consistency with the classification as provided in Commission Decision 2013/480/EU i.e. Type II -FR-SP, as included in Decision IG.22/7, replaced with Type II -A-FR-SP
[e] Correction of error included to ensure consistency with the classification as provided in Commission Decision 2013/480/EU i.e., Type II-A Tyrrhenian replaced Type II-B Tyrrhenian, as included in Decision IG.22/7, since the latter does not exist in the Tyrrhenian Sea
[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.

Known gaps and uncertainties in the Mediterranean

Indicator Title	Common Indicator 13. Concentration of key nutrients in water column (EO5)	
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 *a*, 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 7th Meeting of EcAp Coordination Group
V4	28/05/2025	Joint CorMon Pollution and ML Meeting
V5	19/06/2025	Approved by the Meeting of MED POL FPs
Final version	15/09/2025	Approved by the 12th 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 bellow.

Indicator Title	Common Indicator 14. Chlorophyll *a* concentration in water column (EO5)	
Relevant GES definition	**Related Operational Objective**	**Proposed Target(s)**[3]
Natural levels of algal biomass, water transparency and oxygen concentrations in	Direct and indirect effects of nutrient over-enrichment are prevented	State: • Chlorophyll a

[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 *a* concentration in water column (EO5)	
line with prevailing physiographic, geographic and weather conditions		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 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 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		

[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 *a* concentration in water column (EO5)

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.

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Indicator Title	Common Indicator 14. Chlorophyll *a* concentration in water column (EO5)

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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 following two assessment scales have been established and applied in the Mediterranean sub-regions to assess the Good Environmental Status (GES), as applicable:

a) The Scale of NEAT (Nested Environmental Status Assessment Tool) Integrated Assessment of CIs 13&14

Indicator Title	Common Indicator 14. Chlorophyll *a* concentration in water column (EO5)

- The five-class assessment scale was applied to the data reported by countries for dissolved inorganic nitrogen (DIN), total phosphorus (TP), and chlorophyll-a (Chl-a), enabling their use in calculating assessment criteria for the sub-divisions of the Adriatic Sea sub-regions.
- The five-classes of assessment —High, Good, Moderate, Poor, and Bad—were established, with two boundary limit values that define the scale: i) the Reference Conditions (RC), representing the best conditions (High), and ii) the maximum parameter concentration (i.e., DIN, TP, and Chl-a), representing the worst conditions (Bad). Additionally, a threshold value for the GES/non-GES boundary is defined.
- The decision rule for determining GES/non-GES status is based on comparing score values against the boundary limit defined by the Good/Moderate (G/M) threshold, which distinguishes between the Good and Moderate classes.
- NEAT values range from 0 to 1 and represent the overall status assessment for each parameter, or the integrated assessment of multiple parameters based on the five-class scale. Average concentrations are calculated using geometric means, along with their respective geometric standard deviations and standard errors of the geometric mean. Threshold concentrations are normalized to a scale from 0 to 1 as follows:

$$0 \leq \text{bad} < 0.2 \leq \text{poor} < 0.4 \leq \text{moderate} < 0.6 \leq \text{good} < 0.8 \leq \text{high} \leq 1$$

- The status of class is determined by the linear distance of score values from the two boundary limits: the Reference Conditions and the maximum parameter concentrations, as well as the GES/non-GES threshold. GES status is assigned for values below 0.6, while non-GES status applies to values above 0.6.

NEAT Integrated Assessment of CIs 13&14	**GES**			**non-GES**		
	RC	**High**	**Good**	**Moderate**	**Poor**	**Bad**
Boundary Limits and Normalized NEAT Values	<RC/H limit, not in score scale	1<Score≤0.8	0.8<Score≤0.6	0.6<Score≤0.4	0.4<Score≤0.2	Score≤0.2
Good/non-Good			**G/**	**M**		

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

- This scale was applied to satellite-derived Chlorophyll-a (Chl-*a*) data points to enable their use in calculating assessment criteria for the sub-divisions of the Aegean-Levantine Sea, the Central Mediterranean Sea, and the Western Mediterranean Sea sub-regions.
- The introduction of satellite-derived Chl-a, as a supplementary assessment parameter~~,~~ alongside *in situ* Chl-a data necessitates the statistical calculation of a ~~new~~ set of assessment criteria, in cases where Contracting Parties have not reported proven relationship between *in situ* 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.

Indicator Title	Common Indicator 14. Chlorophyll *a* concentration in water column (EO5)

- 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 *in situ* 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.

Simplified Assessment of CI 14	**GES**		**non-GES**
Boundary Limits*	≤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.

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/

Indicator Title	Common Indicator 14. Chlorophyll *a* concentration in water column (EO5)

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.

UNEP/MAP MED POL (1990a). Activity IV: Research on the effects of pollutants on Marine Organisms and their Populations (UNEP/MAP MED POL Phase I, 1975-1981).

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).

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.

Indicator Title	Common Indicator 14. Chlorophyll *a* concentration in water column (EO5)
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 Adritic Sea Sub-region.	
Indicator analysis methods	
Indicator definition Chlorophyll *a* 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 *a*: Spectrophotometry. ISO 10260 (1992) on spectrometric determination of the chlorophyll *a* concentration provides a standard method for quantification of chlorophyll *a*. 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) The detailed analytical procedure for Chlorophyll *a* 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 microgram per liter (µg/L) - Chlorophyll *a* 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/department-of-nuclear-sciences-and-applications/division-of-iaea-environment-	

Indicator Title	Common Indicator 14. Chlorophyll *a* concentration in water column (EO5)

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 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 *a*, 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 *a* 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 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 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

Traditional methods for eutrophication monitoring in coastal waters involve *in situ* sampling/measurements of commonly measured parameters such as nutrients concentration, chlorophyll *a* concentration, phytoplankton abundance and composition, transparency and dissolved oxygen concentration. Concerning available methods for *in situ* 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 in situ measurements, depending on data requirements

Indicator Title	Common Indicator 14. Chlorophyll *a* concentration in water column (EO5)

Modelling and remote sensing should also be considered as complementary, area integrating in addition to *in situ* measurements, depending on data requirements. In general, *in situ* 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 *in situ* 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 *in vivo* fluorometer and/or nephelometer. Sampling for the determination of *in vitro* 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 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

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

Indicator Title	Common Indicator 14. Chlorophyll *a* concentration in water column (EO5)

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.

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:

Discriminant limit dM = sd * t(α/2; N1+N2-2) * √(1/N1+1/N2)≠ 0

For Chl-a log10 units for different sample size N with the significance level: α/2 = 0,025; with an average sd = 0.30

N = 12 t = 2.074 √(2/12) = 0.408 dM > |0.25|

N = 24 t = 2.013 √(2/24) = 0.289 dM > |0.17|

N = 52 t = 1,983 √(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 chla 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.

Indicator Title	Common Indicator 14. Chlorophyll *a* concentration in water column (EO5)

For open waters sampling frequency should be determined on a sub-regional level following a risk-based approach:

- Water transparency: *id.* Chlorophyll *a*,
- Dissolved Oxygen: *id.* Chlorophyll *a*.

Data analysis and assessment outputs

Statistical analysis and basis for aggregation – Water typology and assessment criteria

The classification scheme on chlorophyll *a* 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:

Type I	coastal sites highly influenced by freshwater inputs,
Type IIA	coastal sites moderately influenced not directly affected by freshwater inputs (Continent influence),
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
σt (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**

Indicator Title	Common Indicator 14. Chlorophyll *a* concentration in water column (EO5)

	Reference conditions of *c*(Chl*a*) (µg/L)		**Boundaries of *c*(Chla) (µg/L) for G/M status**	
	G_mean	90% percentile	*G_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]
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			
	Reference conditions of *c*(Chl*a*) (µg/L)		**Boundaries of *c*(Chl*a*) (µg/L) for G/M status**	
Water Typology	*G_mean*	90 % percentile	*G_mean*	90 % percentile
Type I Adriatic	0,15[g]; 0,29[h]	0,42[f]; 0,81[g]	3,1	8,7
Type II-A Adriatic	0.11	0.29	-	-
Type III-W Adriatic [c]	-	-	0.64	1.7

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

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

$$\text{Chl-a } 90\text{th } percentile_{\text{ (expected)}} = 10^{(log10(\text{Chl-a } Gmean)+1.282\ sd)}$$

[9] Gmean values corresponding to the reference and boundary values of Chla (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.
[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 *a* concentration in water column (EO5)

where 1.282 is the value assumed by the standard normal variable zc for which P(z>zc)=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 $\log_{10}$-transformed chlorophyll a sample distributions ranged from 0.30 to 0.35 across all water types. Specifically:

- 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 a (Chl a), 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 *a*, 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 *in situ* data for the Western,

Indicator Title	Common Indicator 14. Chlorophyll *a* concentration in water column (EO5)

Central Mediterranean, and Aegean and Levantine Seas Sub-regions, satellite-derived data on Chlorophyll-a 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 and 14 level for TP, DIN, and Chlorophyll-a 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 km^2). Within each SAU, under ‘habitats,’ the water types are introduced, and under ‘ecosystem component,’ the three measured parameters (DIN, TP, and Chlorophyll-a) 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-a 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-a (Chla), 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).

Indicator Title	Common Indicator 14. Chlorophyll *a* concentration in water column (EO5)

The Simplified EQR methodology was deemed relevant when complementary data (in situ and remote sensing) was available for Chla only, but typology-based assessment could not be applied. 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 *a*, 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.

Improve the availability of the assessment criteria for CIs 13 and 14:

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.

Improve the GES assessment:

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 *in situ* monitoring and adding additional sub-indicator i.e., the satellite-derived Chl*a* data for GES assessment.

Upgrade present policy measures:

For the development of the adaptive eutrophication management strategies, the following specific actions should also be undertaken:

- Extend the scope of research and monitoring programs to characterize the effects of eutrophication;

Indicator Title	Common Indicator 14. Chlorophyll *a* concentration in water column (EO5)	
○ 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 7th Meeting of EcAp Coordination Group
V4	28/05/2025	Joint CorMon Pollution and ML Meeting
V5	19/06/2025	Approved by the Meeting of MED POL FPs
Final version	15/09/2025	Approved by the 12th 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 bellow.

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 isbelow 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: • 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 fora 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		

[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.
[13] 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)

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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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

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

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

As part of the preparation for the 2023 MED QSR pollution assessment, the following two assessment scales have been established and applied in the Mediterranean sub-regions to assess the Good Environmental Status, as applicable:

a) The Scale of NEAT (Nested Environmental Status Assessment Tool) Integrated Assessment of Contaminants in Sediments and Biota Matrices (IMAP Common Indicator 17)

- The five-class assessment scale was applied to the data reported by countries for mandatory heavy metals and organic contaminants, enabling their use in calculating assessment criteria for the sub-divisions of the Adriatic Sea and Western Mediterranean sub-regions.
- The five-classes of assessment —High, Good, Moderate, Poor, and Bad—is established, with two boundary limit values that define the assessment scale: i) zero contaminant concentration representing the best conditions (High), and ii) the maximum contaminant concentration representing the worst conditions (Bad). Additionally, one threshold value for the GES / non-GES boundary is defined.
- The decision rule for GES/non-GES status is based on comparing score values against the boundary limit defined by the (xBAC) threshold, which distinguishes between the Good and Moderate classes. For trace elements, the threshold is set at 1.5 BACs, while for organic contaminants, the threshold is set at 2 BACs.
- NEAT values range from 0 to 1 and represent the overall status assessment for each contaminant, or the integrated assessment of multiple contaminants, based on the five-class scale. Average concentrations are calculated using arithmetic means, along with their respective standard errors. Threshold concentrations are normalized to a scale from 0 to 1 as follows:

$$0 \leq \text{bad} < 0.2 \leq \text{poor} < 0.4 \leq \text{moderate} < 0.6 \leq \text{good} < 0.8 \leq \text{high} \leq 1$$

- The status of class is determined by the linear distance of score values from the two boundary limits i.e. the zero-contaminant concentration and the maximum contaminant concentration, and the GES/non-GES threshold. GES status is assigned for values below 0.6, while non-GES status applies to values above 0.6.

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

NEAT Integrated 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.		
NEAT scores **0**	1 <score≤0.8	0.8<score≤0.6	0.6<score ≤0.4	0.4< score ≤0.2	Score<0.2	**Max. conc.**
Thresholds	**BAC**	**(xBAC)**	**2 (xBAC)**	**5 (xBAC)**		

b) *The Scale of CHASE+ (Chemical Status Assessment Tool) for Contaminants in Sediments and Biota Matrices (IMAP Common Indicator 17)*

- The five-class assessment scale was used to evaluate contamination levels scale. It was applied to the data reported by countries for mandatory heavy metals and organic contaminants, enabling their use in calculating assessment criteria for the sub-divisions of the Aegean – Ionian and the Central Mediterranean sub-regions
- The five-class assessment: Non-Problem Area - High, Non-Problem Area - Good, Problem Area - Moderate, Problem Area - Poor, and Problem Area (PA) – Bad, is established with the two boundary limit values: i) zero contaminant concentration, representing the best conditions (High), and ii) maximum contaminant concentration, representing the worst 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.

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

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.

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

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

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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.

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.

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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.

UNEP/MAP Report of the Meeting of the Ecosystem Approach Correspondence Group on Pollution Monitoring Marseille, France, 19-21 October 2016.

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).

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

UNEP/MAP WG.462/Inf.4 (2019). Updated List of Priority Contaminants under MAP/Barcelona Convention (Draft). Meeting of the Ecosystem Approach Correspondence Group on Pollution Monitoring, Podgorica, Montenegro, 2-3 April 2019.

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UNEP/MAP WG.509/21 (2021). Monitoring Guidelines/Protocols for Sampling and Sample Preservation of Sediments for IMAP Common Indicator 17: Heavy and Trace Elements and Organic Contaminants. Meeting of the MED POL Focal Points, Videoconference, 6-7 October 2021.

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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.

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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 7**PCBs (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,

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

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 7**PCBs (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.

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

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

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

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

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.

Indicator Title	Common Indicator 17. Concentration of key harmful contaminants measured in the relevant matrix (EO9)
The Monitoring Guidelines for IMAP Common Indicator 17 outline the following monitoring and reporting practices: o B-1. Monitoring Guidelines/Protocols for sampling and analysis of contaminants in sediment; o B-2. Monitoring Guidelines/Protocols for sampling and determination of contaminants in marine biota; o B-3. Monitoring Guidelines/Protocols for sampling and analysis of contaminants in seawater; o E-1. Monitoring Guidelines/Protocols for Analytical Quality Assurance for IMAP Common Indicators 13, 14, 17, 18 and 20; o 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: o 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. o 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. 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	

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

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. *Mytilus galloprovincialis*, as commonly agreed, mandatory IMAP species where present in local ecosystems, *Donax trunculus*, etc.), yearly collection, and fish (i.e. *Mullus barbatus*, 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).4F[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 2011),5F[16] 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.

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[15]Additional definitions for BC can be found in the literature and are explained in UNEP/MED WG.533/Inf.3
[16]For the purpose of this document only the scientific elements have been considered from any reference included in this document. Legal considerations are out of the scope of the present document, which serves exclusively scientific purposes.

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

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.6F[17] 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 2019.7F[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 (*M. galloprovincialis)*, BAC values were calculated as follows: MedBAC=1.5 x MedBC.8F[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 (*M. galloprovincialis).* As for sediments, data with BDL values were used in the calculation of the new BCs. The BDL values were different, depending on the country and even different within the same country. Moreover, BDL values constituted 12% to 90% of the data points depending on the compound.9F[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

[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.

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

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

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 approve 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 upgrae of the criteria, as approved by the Meeting of CorMon Pollution (27 and 30 May 2022). The units of concentration are given in µg/kg dry wt, as requested by IMAP.

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

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

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 meals in mussel (*M. galloprovincialis*) and fish (*M. barbatus*) calculated from data available for upgrade of the criteria, as approved by the Meeting of CorMon Pollution (27 and 30 May 2022). The units of concentration are given as requested by IMAP.

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

** Only a few data points were available for the CEN. The calculated BCs were lower than in other sub-regions, however, the few data are not representative of the CEN.*

> Since new data were not available in the AEL to update BC/BAC values for M. galloprovincialis, it was approved to use the values calculated in 2019.

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

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

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

Table 4. New BC and BAC values for Polycyclic Aromatic Hydrocarbons **(**PAHs) in mussel (*M. galloprovincialis)* calculated from data available for upgrade of the criteria, as approved by the Meeting of CorMon Pollution (27 and 30 May 2022) The unit of concentration is given in µg/kg dry wt, as requested by IMAP. No data were available for the CEN and the AEL Sub-regions.

New BC and BAC values for Polycyclic Aromatic Hydrocarbons (PAHs) in mussel (*M. galloprovincialis*), µg/kg dry wt			
New BC values (2022)			
	MED	WMS	ADR
Naphthalene	0.56	0.52	#
Acenaphthylene	(0.05)#	#	#
Acenaphthene	(0.50)#	#	#
Fluorene	2.50	7.87	#
Phenanthrene	5.35	19.9	2.25
Anthracene	1.12	0.94	#
Fluoranthene	4.83	10.0	#
Pyrene	2.50	5.54	#
Benzo[a]anthracene	0.60	0.69	#
Chrysene	2.54	2.98	#
Benzo(b)fluoranthene	1.00	1.36	#
Benzo(k)fluoranthene	1.00	0.73	#
Benzo[a]pyrene	(1.00)#	0.94	#
Benzo[g,h,i]perylene	1.00	0.67	#
Dibenz[a,h]anthracene	(0.10)#	#	#
Indeno[1,2,3-c,d]pyrene	(0.63)#	0.29	#
Sum 16 PAHs10F[21]	5.80	5.60	6.60
New BAC values (2022)			
	MED	WMS	ADR

[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, 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)

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 soncentrations is given in µg/kg dry wt, as requested by IMAP. For sediments, very limited data were available for the CEN sub-region, while for biota no data were avilable for the CEN and AEL sub-regions. When most (>50%) of the data points were below the detection limit for the sub-regions, BACs were not calculated.

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

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

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.11F[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 IG.22/7 with the sources originally used (i.e., Long et al., 1995, OSPAR, 2009.12F23) The following

[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.

[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,

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

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; Dibenz [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.3.13F[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

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

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

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

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

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

PCBs	**Sediments** EAC[#] IG.22/7 (µg/kg dry wt) – updated	**Sediments** EAC* IG.22/7 (µg/kg dry wt)	**Sediments** EAC** IG.23/6 (µg/kg dry wt)	**Mussel** EAC** IG.22/7 and IG.23/6 (µg/kg dry wt)	**Fish** 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.

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.

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

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 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

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

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 *in situ* 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 experince 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 $C_{measured}/C_{threshold}$ (C is the concentration) called the contamination ratio (CR) for each assessment element in a matrix. Then a contamination score (CS) is calculated as follows[26]:

$$CS = \frac{1}{\sqrt{n}} \sum_{i=1}^{n} CR_i$$

where n is the number of elements assessed for each matrix.

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+ assesmnet methodologies were perfomed. 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.

[25] Andersen, J.H., Murray, C., Larsen, M.M., Green, N., Høgåsen, T., Dahlgren, E., Garnaga-Budrė, 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'.

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

Update of Environmental Assessment Criteria (EACs):

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.

Undertake regular updates of Sub-regional and regional Background Concentrations (BCs) and Background Assessment Criteria (BACs):

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 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 (*M. galloprovincialis* and *M. barbatus*) 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.

[27] OSPAR 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 the latest lists of priority contaminants development in the EU region and internationally and shows no major changes compared to other RSCs.

Indicator Title	Common Indicator 17. Concentration of key harmful contaminants measured in the relevant matrix (EO9)	
○ 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
Final version	09/09/2019	Approved by the 7th Meeting of EcAp Coordination Group
V4	28/05/2025	Joint CorMon Pollution and ML Meeting
V5	19/06/2025	Approved by the Meeting of MED POL FPs
Final version	15/09/2025	Approved by the 12th 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 bellow.

<table>
<tr><td>Indicator Title</td><td colspan="2">Common Indicator 18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)</td></tr>
<tr><td>Relevant GES definition</td><td>Related Operational Objective</td><td>Proposed Target(s)[29]</td></tr>
<tr><td>Concentrations of contaminants are not giving rise to negative effects on health status of marine biota</td><td>Effects of released contaminants are minimized</td><td>State:
• Contaminants effects below thresholds.
Pressure:
• Decreasing trend in the operational releases of oil and other contaminants from coastal, maritime and offshore activities.</td></tr>
<tr><td colspan="3">Rational</td></tr>
<tr><td colspan="3">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 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 hotpots 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.</td></tr>
</table>

[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)

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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Indicator Title	Common Indicator 18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)

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Indicator Title	Common Indicator 18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)

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Indicator Title	Common Indicator 18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)
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.

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 *in situ* biomarker data. All relevant national and international

Indicator Title	Common Indicator 18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)
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 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/	

Indicator Title	Common Indicator 18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)

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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)

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Indicator analysis methods

Indicator definition

In marine bivalves (such as *Mytilusgalloprovincialis*) and/or fish (such as *Mullus barbatus*)

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).

Indicator Title	Common Indicator 18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)

- 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).
- 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.

Indicator Title	Common Indicator 18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)

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

Indicator Title	Common Indicator 18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)

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 Mytilus sp.) and fish (such as Mullus barbatus).

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 Mytilus sp.) and fish (such as Mullus barbatus);
- 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.

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ICES Cooperative Research Report. No.315. Integrated marine environmental monitoring of chemicals and their effects. I.M. Davies and D. Vethaak Eds., November 2012.

Indicator Title	Common Indicator 18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)

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 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:

Indicator Title	Common Indicator 18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)

- C-1. Monitoring Guidelines/Protocols for sampling and analysis of biomarkers in marine molluscs (such as Mytilus sp.) and fish (such as Mullus barbatus).
- 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.
- 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.

Indicator Title	Common Indicator 18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)

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 *Mytilus galloprovincialis*) 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 *Mytilus galloprovincialis*, and fish, such as *Mullus barbatus*.

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.

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

Indicator Title	Common Indicator 18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)

Mediterranean BACs and EACs for biomarkers in mussel (*M. galloprovincialis*)

as endorsed by Decisions IG.22/7 and IG.23/6.

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

[a]*Technical annex: assessment criteria for biological effects measurements. Integrated monitoring of chemicals and their effects. ICES Cooperative Research Report No. 315. Davies, I.M. and Vethaak, A.D.Eds.*

**Moore et al., 2006 (Standard values adopted by ICES)*

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.

Indicator Title	Common Indicator 18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)

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 GES, it would be carried out using Mediterranean data from IMAP Info System and relevant scientific literatur 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, *Mytilus galloprovincialis* and *Mullus barbatus*, 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

Indicator Title	Common Indicator 18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9)

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 combing the chemical and ecotoxicological data, to support the evaluation of the risk related to marine 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 7th Meeting of EcAp Coordination Group
V4	28/05/2025	Joint CorMon Pollution and ML Meeting
V5	19/06/2025	Approved by the Meeting of MED POL FPs
Final version	15/09/2025	Approved by the 12th 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 bellow.

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 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 thropic 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 Mytillus galloprovincialis 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.		
Scientific references		

[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)

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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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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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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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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

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)
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.	

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).

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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

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)

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 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.

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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

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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).

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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.

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)

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 Definition

Number of detected regulated contaminants* in commercial species.

Proportion of detected regulated contaminants* exceeding regulatory limits.

Sub-indicators: 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 *Statistical Analysis and Basis for Aggregation – Assessment Criteria*.

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

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)

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 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/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):

- 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.

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)

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);

ii. Recently reviewed literature, due to the absence of *in situ* 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:

i. Data/reports that might be available from https://cdr.eionet.europa.eu/ (MSFD) that should be further discussed with EIONET;

ii. 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 metals in foodstuffs for the protection of human health, as provided in EC/EU Directives1881/2006 and its amendments 488/2014 and 1005/2015. The concentrations are presented in mg/kg wet wt.

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)

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
Crustaceans	0.5	0.5	0.5
bivalve mollusk	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) 1881/200.6. The concentrations are presented in µg/kg wet wt.

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

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)

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 dioxinsand 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.

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:

i. **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 *in situ* data reported for CI 20. CI 17 data for *M. galloprovincialis* were available only for the WMS and the ADR, and CI 17 TM data for M. barbatus were available for the ADR (56 data points), CEN (15 data points) and AEL (213 data points).
ii. **The Environmental Assessment of CI 20 based on recent peer reviewed literature** in the absence of *in situ* data reported in IMAP IS for CI 20, Examination of the literature data per

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)

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 determine, 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 procced 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 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

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)	
V.3	31/05/2019	Approved by the Meeting of MED POL FPs
Final version	09/09/2019	Approved by the 7th Meeting of EcAp Coordination Group
V4	28/05/2025	Joint CorMon Pollution and ML Meeting
V5	19/06/2025	Approved by the Meeting of MED POL FPs
Final version	15/09/2025	Approved by the 12th 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 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 hotpots 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 *enterococci sp*. might be more appropriate than traditional *Escherichia coli* 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 *E.coli*. 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. *et al.*, 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, *et al.* 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.		

[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)
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 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 (95^{th} percentile < 100 CFU/100 mL) or good (95^{th} percentile < 200 CFU/100 mL) quality categories for the “last assessment”; which means the last four years.

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; 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 90^{th} or 95^{th} 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).

Indicator Title	Common Indicator 21. Percentage of intestinal enterococci concentration measurements within established standards (EO9)

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

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

Indicator Title	Common Indicator 21. Percentage of intestinal enterococci concentration measurements within established standards (EO9)
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: Based upon percentile evaluation of the log10 normal probability density function of microbiological data acquired from the particular bathing water, the 90th and 95thpercentile 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 (μ + 1,282 σ). The upper 95-percentile point of the data probability density function is derived from the following equation: upper 95-percentile = antilog (μ + 1,65 σ).	
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 (*Enterococcus faecalis*, *E. faecium*, *E. durans*and *E. hirae*), pointing out that, other Enterococcus species and some species of the genus Streptococcus (namely *S. bovis*and *S. equinus*) 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,	

Indicator Title	Common Indicator 21. Percentage of intestinal enterococci concentration measurements within established standards (EO9)

enterococci sp. 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

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.

Indicator Title	Common Indicator 21. Percentage of intestinal enterococci concentration measurements within established standards (EO9)
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**
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

Indicator Title	Common Indicator 21. Percentage of intestinal enterococci concentration measurements within established standards (EO9)

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."

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)		
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

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

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	19/06/2025	Approved by the Meeting of MED POL FPs
Final version	15/09/2025	Approved by the 12th Meeting of EcAp Coordination Group

Appendix 4

Updated Guidance Factsheets for IMAP Candidate Common Indicators 26 and 27

1 Introduction

1. 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.

2. 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.

3. 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.

2 Guidance Factsheet on IMAP Candidate Common Indicators 26 and 27

4. 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 bellow.

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 definition[1]	**Related Operational Objective**	**Proposed Target(s)**[2]
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 (Urick, 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.

[1] 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.

[2] 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 register[3]") 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. 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.

[3] See for example: http://underwaternoise.ices.dk/map.aspx ; https://quietseas.ctnaval.com/

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:

1. **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)[4], over 1 day, is 20% or lower (≤20%).
2. **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 (≤10%).
3. 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).

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.

[4] 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.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 period[5].
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. QUITEMED2 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 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).

[5] This definition was formerly called ***pulse-block days*** (PBDs).

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:

1. For low frequency sources: no minimum level, i.e. all sources to be registered
2. 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 µPa² m² 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

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*[6] 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

[6] 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

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}).
- 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
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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	15/09/2025	Approved by the 12th Meeting of EcAp Coordination Group

5. 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 definition[7]	**Related Operational Objective**	**Proposed Target(s)**[8]
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. 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 (Urick, 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		

[7] 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.

[8] ibidem

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

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; Pirotta et al., 2012; Putland et al., 2017; Tennessen & Parks, 2015; Williams et al., 2014; Wysocki et al., 2006).

Scientific references

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Hildebrand, J. A., & Jesus, S. M. (2021). Trends in inputs of anthropogenic noise into the marine environment. The Second World Ocean Assessment, 860–883. https://doi.org/10.18356/9789216040062c049

Jalkanen, J. P., Johansson, L., Andersson, M. H., Majamäki, E., & Sigray, P. (2022). Underwater noise emissions from ships during 2014–2020. Environmental Pollution, 311. https://doi.org/10.1016/j.envpol.2022.119766

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Vessel noise affects beaked whale behavior: results of a dedicated acoustic response study. PloS One, 7(8), e42535. https://doi.org/10.1371/journal.pone.0042535

Tennessen, J. B., & Parks, S. E. (2015). Acoustic propagation modeling indicates vocal compensation in noise improves communication range for North Atlantic right whales. Endangered Species Research, 30(1), 225–237. https://doi.org/10.3354/esr00738

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

Williams, R., Erbe, C., Ashe, E., Beerman, A., & Smith, J. (2014). Severity of killer whale behavioral responses to ship noise: A dose-response study. Marine Pollution Bulletin, 79(1–2), 254–260. https://doi.org/10.1016/j.marpolbul.2013.12.004

Wysocki, L. E., Dittami, J. P., & Ladich, F. (2006). Ship noise and cortisol secretion in European freshwater fishes. Biological Conservation, 128(4), 501–508. https://doi.org/10.1016/j.biocon.2005.10.020

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

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

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

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:

- **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.

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:

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

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.

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 67^{th} 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.

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

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., Sigray, 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.

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

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

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:

- 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 personification 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?

Monitoring Protocol: 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).

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

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

Spatial scope: 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.

Location of sampling sites:

- 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);
- 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).

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

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 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,

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

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.

Contacts and Version Date

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Appendix 5

Indicator Guidance Factsheet for the Common Indicator 15

Indicator Guidance Factsheet for the Common Indicator 15

Ecological Objective 7	Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems.	
Indicator Title	Location and extent of the habitats potentially impacted by hydrographic alterations	
Relevant GES definition	**Related Operational Objective**	**Proposed Target(s)**
Negative impacts due to new structure are minimal with no influence on the larger scale coastal and marine system.	Alterations due to permanent constructions on the coast and watersheds, marine installations and seafloor anchored structures are minimised.	Planning of new structures takes into account all possible mitigation measures in order to minimize the impact on coastal and marine ecosystem and its services integrity and cultural/historic assets. Where possible, promote ecosystem health.

Rationale

Justification for indicator selection

After agreeing to progressively apply the ecosystem approach (EcAp) to the management of human activities in the Mediterranean at the 15th Meeting of the Contracting Parties to the Barcelona Convention (COP15, 2008), the Contracting Parties agreed, at COP17 in 2012, on an overall vision and goals for EcAp, and on 11 ecological objectives for the Mediterranean. Among these ecological objectives was the Ecological Objective 7 („Alteration of ~~hydrographical~~hydrographic conditions“), with its clearly outlined operational objectives and indicators. EO7 corresponds to Descriptor 7 (Permanent alteration of ~~hydrographical~~hydrographic conditions does not adversely affect marine ecosystems) of the European Marine Strategy Framework Directive (MSFD).

Ecological Objective 7 („Alteration of ~~hydrographical~~hydrographic conditions“) addresses permanent alterations in the ~~hydrographical~~hydrographic regime of currents, waves and sediments due to new large-scale developments that have the potential to alter ~~hydrographical~~hydrographic conditions. An agreed common indicator - 'Location and extent of habitats potentially impacted by hydrographic alterations' considers marine habitats which may be affected or disturbed by changes in hydrographic conditions (currents, waves, suspended sediment loads).

There is a clear link between EO7 and other ecological objectives, especially EO1 (Biodiversity). Such link needs to be determined on a case-by-case basis. Refer to Annex 1 for habitats to be considered in EO7. Ultimately, the assessment of impacts, including cumulative impacts, is a cross-cutting issue for EO1 and EO7.

Scientific References

EC JRC (2015). Review of Commission Decision 2010/477/EU concerning MSFD criteria for assessing good environmental status Descriptor 7: Permanent alteration of ~~hydrographical~~hydrographic conditions does not adversely affect marine ecosystems

EMEC Ltd (2005). Environmental impact assessment (EIA) guidance for developers at the European Marine Energy Centre.

OSPAR Commission (2012). MSFD Advice document on Good environmental status - Descriptor 7: ~~Hydrographical~~Hydrographic conditions. A living document - Version 17 January 2012.

OSPAR Commission (2013). Report of the EIHA Common Indicator Workshop.

Royal Haskoning DHV (2012). Environmental Impact Assessment (EIA) and Appropriate Assessment (AA) Evaluation of assessment tools and methods. Lot 2: Analysis of case studies of port development projects in European estuaries. Tidal Rover Development (TIDE) Interreg IVB

Some reference and guidance documents on EIA can be found at:

Ecological Objective 7	Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems.
Indicator Title	Location and extent of the habitats potentially impacted by hydrographic alterations

http://ec.europa.eu/environment/eia/eia-support.htm and in the „Guidance Document

on how to reflect changes in ~~hydrographical~~hydrographic conditions in relevant assessments" (UNEP/MAP/PAP, 2015).

Policy Context and targets

Policy context description

Following the COP17 agreement on an overall vision and goals for EcAp, on 11 ecological objectives, operational objectives and indicators for the Mediterranean, a six-year cyclic review process of EcAp implementation was established (EcAp MED I 2012-2015), with the next EcAp cycle set to cover 2016-2021.

At COP18, in 2013, the targets for achieving GES of the Mediterranean Sea and its coastal zone by 2020 were adopted. In addition, through Decision IG. 21/3 (the so called "COP18 EcAp Decision") the EcAp roadmap was agreed on. The Contracting Parties also agreed to design an Integrated Monitoring and Assessment Programme (IMAP) by COP19, which would, for the first time, ensure a common assessment basis for the Mediterranean marine and coastal environment. At COP19, in 2016, the IMAP was adopted. The IMAP provides guidance to the parties on how to practically implement quantitative monitoring and assessment of the ecological status of the Mediterranean Sea and coast in line with the EcAp.

As part of the EcAp roadmap, expert-level monitoring discussions took place in the various Correspondence Groups on Monitoring (CORMONs) meetings on Biodiversity and Fisheries; Pollution and Litter; and Coast and Hydrography sub-clusters. An Integrated Correspondence Group on Monitoring Meeting (Integrated CORMON) took place on 30 March-1 April 2015, to discuss the main elements of the Integrated Monitoring and Assessment Programme.

As for Protocols of the Barcelona Convention relevant for the EO7, the Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean calls to Contracting Parties of the Barcelona Convection for continuous monitoring of ecological processes, population dynamics, landscapes, as well as the impacts of human activities (Article 7 b). In addition, it calls to Parties to evaluate and take into consideration the possible direct or indirect, immediate or long-term impacts, including the cumulative impact of the projects and activities, on protected areas, species and their habitats (Article 17).

Another Protocol of the Barcelona Convention, the Protocol on the Integrated Coastal Zone Management in the Mediterranean, in its Article 9, calls for Parties to minimize negative impacts on coastal ecosystems, landscapes and geomorphology, coming from infrastructure, energy facilities, ports and maritime works and structures; or where appropriate to compensate these impacts by non-financial measures. In addition, the Article 9 demands maritime activities to be conducted "in such a manner as to ensure the preservation of coastal ecosystems in conformity with the rules, standards and procedures of the relevant international conventions".

Out of other international legislation that can be relevant for the EO7 Ecological Objective, it is essential to mention Marine Strategy Framework Directive – MSFD 2008/56/EC since EcAp's EO7 corresponds to MSFD's Descriptor 7 to large extent. The ~~hydrographical~~hydrographic conditions outlined under the MSFD are, to a large extent, comparable to the hydromorphological conditions referred to under the Water Framework Directive (WFD) which calls for the protection of all water ~~resources~~bodies, including coastal waters. EO7 overlaps with other policy frameworks, such as the Environmental Impact Assessment (EIA) procedure on the assessment of the environmental impacts of certain public and private projects; the Strategic Environmental Assessment (SEA) procedure on the assessment of the effects of certain plans and programs on the environment; assessments undertaken under Marine Spatial Planning (MSP); and in the context of integrated coastal zone management (ICZM).

Ecological Objective 7	Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems.
Indicator Title	Location and extent of the habitats potentially impacted by hydrographic alterations

Targets

Planning of new structures takes into account all possible mitigation measures in order to minimize the impact on coastal and marine ecosystem and its services, integrity and cultural/historic assets. Where possible, promote ecosystem health.

Policy documents

Protocol on the ICZM in the Mediterranean - http://www.pap-thecoastcentre.org/pdfs/Protocol_publikacija_May09.pdf

Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean - http://www.rac-spa.org/sites/default/files/protocole_aspdb/protocol_eng.pdf

MSFD Directive - http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0056&from=EN

WFD Directive - https://eur-lex.europa.eu/resource.html?uri=cellar:5c835afb-2ec6-4577-bdf8-756d3d694eeb.0004.02/DOC_1&format=PDF

Other EU-related documents can be found at: http://ec.europa.eu/environment/eia/eia-support.htm

Indicator analysis methods

Indicator Definition

The EO7 Common Indicator reflects location and extent of the habitats potentially impacted by the alterations and/or the circulation changes induced by them. It concerns area/habitat of the seafloor lost by the construction of the structure itself, i.e. the „footprint“ of the structure; and the surrounding area of potentially affected habitats. This surrounding area should be estimated based on the data/information extracted from the EIA (Environmental Impact Assessment) and/or Strategic Environmental Assessment (SEA) procedures to which these structures are subject.

Methodology for indicator calculation

Methodology used for indicator measurement encompasses elaboration on:

(i) Mapping of the area where human activities cause permanent loss of the seafloor by the construction of the structure itself, i.e. the „footprint“ of the structure; and

(ii) Mapping of the surrounding area around the structure of potential changes to habitats. These areas (under i and ii) should be estimated based on the data/information extracted from the Environmental Impact Assessment (EIA) and/or Strategic Environmental Assessment (SEA) reports required for such structures and possibly from Marine Spatial Planning (MSP) documents; and

(iii) Intersection of the spatial map of the areas of these ~~hydrographical~~hydrographic changes (defined under i and ii) with spatial maps of habitats to determine the areas of individual habitat types that are impacted by ~~hydrographical~~hydrographic changes. Link to EO1- habitat map. Until the habitat map from EO1 is available the Contracting Parties will use their own habitat maps.

New structures to be considered under EO7 assessment:

As far as the type and dimension of structures to be taken into account: use the case by case approach depending on the nature of the coast, the function of the structure and the depth reached by the structure where appropriate threshold values are taken into account (such as absolute surface in m², range of depths where structure will be built (to avoid habitat “segmentation”)). As an additional criterion it was agreed that all permanent structures, for which an EIA and/or a planning/building permit is required, should be considered.

If the EIA does not provide a sufficient level of information, other available sources of information concerning similar or close sites have to be explored: historical evolution of sediment supply, analysis

Ecological Objective 7	Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems.
Indicator Title	Location and extent of the habitats potentially impacted by hydrographic alterations

of the evolution of the coastline and the seabed, analysis of the impact of existing defence structures and ports on the morphodynamics of the coastline and alike.

These available data and studies are not directly applicable to assess ~~hydrographical~~hydrographic alterations induced by the new structure. Nevertheless, they can be used by experts to extrapolate evolution tendencies on the site of interest, thus providing a first level of characterization of expected hydrographic alterations and allowing to roughly specify their extent and location.

At the end, the results of the above assessments are integrated on one single GIS layer (i.e. ~~hydrographical~~hydrographic alterations GIS layer). The last step of the EO7 indicator calculation consists of overlaying ~~hydrographical~~hydrographic alterations GIS layer with habitats GIS maps/layer. Calculations are made with GIS tools in order to define habitats potentially impacted by hydrographic alterations.

If the assessment of hydrographic alterations presents a high level of uncertainty, a risk-based approach can be used to identify habitats that are most sensitive to expected alterations. To do this sensitivity matrix can be used (see for instance: La Rivière M. et al., 2018. *An assessment of French Mediterranean benthic habitats' sensitivity to physical pressures.* UMS PatriNat, AFB-CNRS-MNHN. Paris, 86 pp.).

Due to the ecological importance of *Posidonia* meadows in the Mediterranean Sea and their vulnerability to coastal development, a specific paragraph for this habitat is presented.

Particular considerations for *Posidonia* meadows:

In addition to direct impacts, induced by the structure itself, which will definitively destroy the meadow by recovery, some construction techniques and then indirect impacts, following its construction, on currents and sedimentary transport, may also alter this habitat, on areas much larger than the structure footprint.

Indeed, the *Posidonia* is very sensitive to water turbidity, even transient. Also, during the construction of the structure, a turbid cloud can be generated (discharge at sea of fine materials). This turbid cloud will decrease the transparency of the water, and therefore photosynthesis, in the short term; it can also be deposited on the seagrass meadow that can cause smothering by hyper sedimentation. The thinnest sediments can also be resuspended during storms, thus decreasing the transparency of the water in the long term. Major seagrass meadow destructions due to these phenomena have been observed, for example, in France following the construction of the ports of Pointe Rouge in Marseille and Mouillon in Toulon.

Moreover, the construction machines are often fixed on the bottom, for stability reasons, directly and / or by means of anchors, which has a very negative impact on the bottoms: digging holes (feet of the machines) or furrows (chains of anchors) in the *Posidonia oceanica* meadows.

Once the structure is built, its presence can modify the sedimentary transit and induce areas of erosion and accumulation around it. These modifications will alter the equilibrium between the sedimentation rate and the vertical growth of *Posidonia*. So, if the rate of sedimentation exceeds 5-7cm / year, the vegetative points die; conversely, if this rate is zero or negative (sediment departure), the rhizomes are loosened; they are then very sensitive to breakage (hydrodynamism, anchors, trawling, etc.)

It should also be noted that it is extremely rare for a seagrass meadow to survive in a harbor basin in the medium or long term.

In order to avoid all these phenomena, it is therefore advisable to:

- Use materials and construction techniques that minimize the suspension of fine particles that can induce turbidity in the surrounding waters. (for example: the dumping of fine materials (diameter less than 1 mm) at sea, or of blocks mixed with fine materials, is to be excluded completely;

Ecological Objective 7	Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems.
Indicator Title	Location and extent of the habitats potentially impacted by hydrographic alterations

when rockfill is installed, it is advisable to rinse the blocks of rock; geotextile protective screens must be put in place around the site to minimize turbidity induced).

- Avoid the use of construction machines located at sea by favouring the use of machines lying on the ground. if it is essential to use them at sea, they must not be anchored or relied on *Posidonia* meadows.
- Avoid carrying out construction work in summer, when the plant rebuilds its reserves for the following year
- Build a new development at several tens of meters from the closest living *Posidonia* meadow
- Avoid constructions in areas covered with *Posidonia* meadows, as appropriate
- Monitor the condition of the surrounding seagrass, both during and at the end of the work.

(These elements on *Posidonia* meadows have been taken from: Boudouresque et al., 2006, Préservation des herbiers à *Posidonia oceanica*. RAMOGE pub.: 1-202, N°ISBN 2-905540-30-3)

Indicator units

- km^2 of impacted habitats

List of Guidance documents and protocols available

UNEP/MAP/PAP (2015). Guidance document on how to reflect changes in ~~hydrographical~~hydrographic conditions in relevant assessment (prepared by Spiteri, C.). Priority Actions Programme. Split, 2015.

UNEP(DEPI)/MED IG.22. UNEP(DEPI)/MED IG.22/Inf.7 (2016). Draft Integrated Monitoring and Assessment Guidance

UNEP(DEPI)/MED WG.433/1 (2017) PAP/RAC Meeting of the Ecosystem Approach Correspondence Group on Monitoring (CORMON) on Coast and Hydrography – Working Document

Advice document on hydrographical conditions (Descriptor 7) in the context of MSFD, published by OSPAR Commission (2012);

Scientific and technical review of the MSFD Commission Decision 2010/477/EU in relation to Descriptor 7 carried out by the EC JRC; etc.

Data Confidence and uncertainties

Data used or produced for the monitoring should be in agreement with Shared Environmental Information System (SEIS) principles. More on SEIS principles can be found in Draft Integrated Monitoring and Assessment Guidance.

Methodology for monitoring, temporal and spatial scope

Available Methodologies for Monitoring and Monitoring Protocols

At this stage, there is no clear available methodology and monitoring protocols (see **Known gaps and uncertainties in the Mediterranean).**

Some methodologies or protocols could be proposed, once done an inventory of existing and available data in Mediterranean Sea.

For more details, see “Guidance document on how to reflect changes in ~~hydrographical~~hydrographic conditions in relevant assessments“ (2015)

Ecological Objective 7	Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems.
Indicator Title	Location and extent of the habitats potentially impacted by hydrographic alterations

Available data sources

Global marine data source at the scale of the Mediterranean Sea:

- EMODnet Central Portal (http://www.emodnet.eu/)
- Mediterranean Marine Data (http://www.mediterranean-marinedata.eu/)
- Copernicus, Marine environment monitoring service (http://marine.copernicus.eu/)

Available regional or local data sources (in each country) should be also identified.

Spatial scope guidance and selection of monitoring stations

The monitoring will focus on habitats of interest, around new permanent constructions (lasting more than 10 years) in coastal waters.

The study area should depend on the footprint of the new construction considered and on the local (or regional) geographical and marine conditions. It should be large enough:

- to show all the hydrographic alterations induced by the construction, even for long term;
- to follow all the habitats of interest that could be potentially impacted.

It should be highlighted if monitoring was performed in sensitive areas, such as marine protected areas, spawning, breeding and feeding areas and migration routes of fish, seabirds and marine mammals, since they are priority.

Temporal Scope guidance

Contracting parties report every 6 years of all new permanent structures built during this reporting period.

Data analysis and assessment outputs

Statistical analysis and basis for aggregation

Expected assessments outputs

All the outputs that came out of the monitoring (I.e. trend analysis, distribution maps, etc.) should be listed, along with source(s) where they can be found.

The outputs to be reported are (map and GIS data):

- The area and location where the future structure will be built (footprint);
- The area and location of the habitats of interest potentially impacted by the structures (surrounding area of potentially affected habitats)

For the area and location where the future structure will be built, additionally to the surface representation of the structure, some information has to be provided as attributes of the GIS layer. The following attributes are proposed:

Country	*Locality / District*	*ID of the structure*	*Role of structure*	*Type of structure*	*Materials*	*Extend on the sea floor (in km^2)*
Specify the country	*Specify the location of the structure*	*The ID must be unique to identify the structure. It could be a number or a numbered code using letters from the previous column*	*Harbour, coastal defense, marine energy, …*	*Quay, groynes, wind farm, …*	*Concrete, rockfill, …*	*Area of the structure on sea floor. The used unity has to be provided in the name of the field*

Ecological Objective 7	Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems.
Indicator Title	Location and extent of the habitats potentially impacted by hydrographic alterations

If the structure is composite (in terms of type, materials, ...), several GIS surface objects could be defined.

For the area and location of expected ~~hydrographical~~hydrographic alterations, additionally to the surface representation of these alterations, some information has to be provided as attributes of the GIS layer.

The following attributes are proposed:

Country	*Locality / District*	*ID of the structure*	*Nature of expected hydrographic alterations*	*Data used*	*Level of assessment confidence*	*Extend of hydrographical alteration (in km^2)*
Specify the country	*Specify the location of the structure*	*The ID must be unique to identify the structure. It could be a number or a numbered code using letters from the previous column*	*Waves/currents attenuation; anthropic changes of bathymetry; changes in sediment transit inducing erosion/sedimentation;*	*Data provided by EIA, SEA, MSP; dredging/disposal scheme, plan for extension of port/marina; ...*	*Low/Medium /Good*	*Area of the structure on sea floor (footprint) and its surrounding area as defined in the EIA, SEA, MSP.*

For each GIS data layer produced, a metadata file must be added. This file must provide information on: creation date of the GIS data, GIS data author, contact information, source agency, map projection and coordinate system, scale, error, explanation of symbology and attributes, data dictionary, data restrictions, and licensing (see for instance INSPIRE Directive).

Known gaps and uncertainties in the Mediterranean

There are general difficulties, not particular to the Mediterranean context, that can be identified for EO7:

- Lack of coherence in definitions, standard approaches in the development and application of indicators and in the assessment of impacts, together with lack of methodological standards.
- Lack of knowledge and understanding on the link between physical pressures and biological impacts and on the cumulative impacts.

Another difficulty comes from the ~~hydrographical~~hydrographic alterations that EO7 indicator should assess. These alterations, around a particular coastal construction, often change in intensity, in area and indeed in time, depending on the off-shore hydrographical conditions (calm weather/extreme event; seasonality of waves height and directions; local wind conditions…) and on the morphologic history of the site (the present state is due to the succession of these different conditions).

Contacts and version Date

Key contacts within UNEP for further information

Version No	**Date**	**Author**
V.1	27/6/16	PAP/RAC
V2	11/07/16	Olivier Brivois
V3	13/07/16	Olivier Brivois
V4	16/03/17	Olivier Brivois
V5	19/06/18	Olivier Brivois
V6	26/07/18	Olivier Brivois
V7	14/05/2025	PAP/RAC

Annex I: Reference list of habitats to be considered (Link to EO1)

Indicator guidance factsheet for EO8 Coastal Ecosystems and Landscapes Common Indicator 16 "Length of coastline subject to physical disturbance due to the influence of human-made structures"

<table>
<tr><td>Ecological Objective 8:</td><td colspan="2">The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved</td></tr>
<tr><td>Indicator Title</td><td colspan="2">Length of coastline subject to physical disturbance due to the influence of human-made structures</td></tr>
<tr><td>Relevant GES definition</td><td>Related Operational Objective</td><td>Proposed Target(s)</td></tr>
<tr><td>Physical disturbance to coastal areas induced by human activities should be minimized.</td><td>The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved.</td><td>Negative impacts of human activities on coastal areas are minimized through appropriate management measures.</td></tr>
<tr><td colspan="3">GES, targets and measures cannot be expressed quantitatively (as a threshold value) but due to country specific circumstances (socio-economic, cultural, historical) should be defined by the countries themselves. In doing so the CPs should take their spatial development and planning policies into account, as well as the legal obligations of the Barcelona Convention, in particular the ICZM Protocol. The Guidance document "Assessment criteria and the Guiding document for application of assessment criteria for the IMAP Common Indicator 16" was endorsed by the Meeting of the CORMON on Coast and Hydrography in 2023 and by the Decision IG.26/3 on Med 2023 QSR at CoP 23 (December 2023). It should be used to define GES, targets and for the assessment requirements. The above GES definition and Proposed target(s) are just examples.</td></tr>
<tr><td colspan="3">Rationale</td></tr>
<tr><td colspan="3">Justification for indicator selection

Mediterranean coastal areas are particularly threatened by coastal development that modifies the coastline through the construction of buildings and infrastructure for residential, commercial, transport and tourist activities. The land, intertidal zone and near-shore estuarine and marine waters are increasingly altered by the loss and fragmentation of natural habitats and by the proliferation of a variety of built structures, such as ports, marinas, breakwaters, seawalls, jetties and pilings. These coastal human-made infrastructures cause irreversible damage to landscapes, losses in habitat and biodiversity, and strong influence on the configuration of the shoreline. Indeed, physical disturbance due to the development of artificial structures in the coastal fringe can disrupt the sediment transport, reduce the ability of the shoreline to respond to natural forcing factors, and fragment the coastal space. The modification of emerged beach and elimination of dune system contribute to coastal erosion phenomena by lessening the beach resilience to sea storms. Coastal defence infrastructures have been implemented to solve the problem together with beach nourishment but preserving the natural shoreline system with adequate sediment transport from river has proved to be the best solution.

Monitoring the length of coastline subject to physical disturbance due to the influence of human-made structures and its trend is of paramount importance to preserve habitat, biodiversity and prevent coastal erosion phenomena, as well as for its importance in land-sea interactions. Until now there has not been systematic monitoring in Mediterranean regarding this, in particular not quantitatively based monitoring or any major attempt to homogenously characterize coastal ecosystems on a wider Mediterranean basis. The status assessment of EO8 aims to fill this gap.</td></tr>
<tr><td colspan="3">Scientific References

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</table>

Ecological Objective 8:	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	Length of coastline subject to physical disturbance due to the influence of human-made structures

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Policy Context and targets

Policy context description

ICZM Protocol (Article 8, point 3):

The Parties shall also endeavour to ensure that their national legal instruments include criteria for sustainable use of the coastal zone. Such criteria, taking into account specific local conditions, shall include, inter alia, the following:

(a) identifying and delimiting, outside protected areas, open areas in which urban development and other activities are restricted or, where necessary, prohibited;

(b) limiting the linear extension of urban development and the creation of new transport infrastructure along the coast;

(c) ensuring that environmental concerns are integrated into the rules for the management and use of the public maritime domain;

(d) providing for freedom of access by the public to the sea and along the shore;

(e) restricting or, where necessary, prohibiting the movement and parking of land vehicles, as well as the movement and anchoring of marine vessels, in fragile natural areas on land or at sea, including beaches and dunes.

Ecological Objective 8:	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	Length of coastline subject to physical disturbance due to the influence of human-made structures

Targets

Negative impacts of human activities on coastal areas are minimized through appropriate management measures.

Additional country-specific criteria should be taken into account for definition of targets, measures and interpretation of results regarding this indicator due to strong socio-economic, historic and cultural dimensions in addition to characteristic geomorphological and geographical conditions in each respective country (reflected in policy documents, strategies and other country-specific documents). The interpretation of results should be left to the countries taking above criteria into account.

Policy documents

Protocol on the ICZM in the Mediterranean - http://www.pap-thecoastcentre.org/pdfs/Protocol_publikacija_May09.pdf

Indicator analysis methods

Indicator Definition

The monitoring aim of the EO8 common indicator is twofold: (i) to quantify the rate and the spatial distribution of the Mediterranean coastline artificialitsation and (ii) to provide a better understanding of the impact of those structures to the shoreline dynamics. It has an operational target on impact thus it is associated to concrete implementation measures related to specific human activities (i.e. appropriate management measures) to minimize negative impacts and to inform about progress towards GES.

Methodology for indicator calculation

The monitoring of this Common Indicator entails an inventory of the length and location of human-made coastline (hard coastal defence structures, ports, marinas (see Figure 1). Soft techniques e.g. beach nourishment are not included.

In addition, coastline is considered artificial only if landward structures intersect the reference coastline.

Archaeological remains are considered a separate category. Other human-made structures that do not fall into any established categories (e.g. parking lots, quarries, pilings, if not part of port and marinas, etc) are considered as ‘Other’.

The off-shore breakwaters are projected to the reference coastline as artificial.

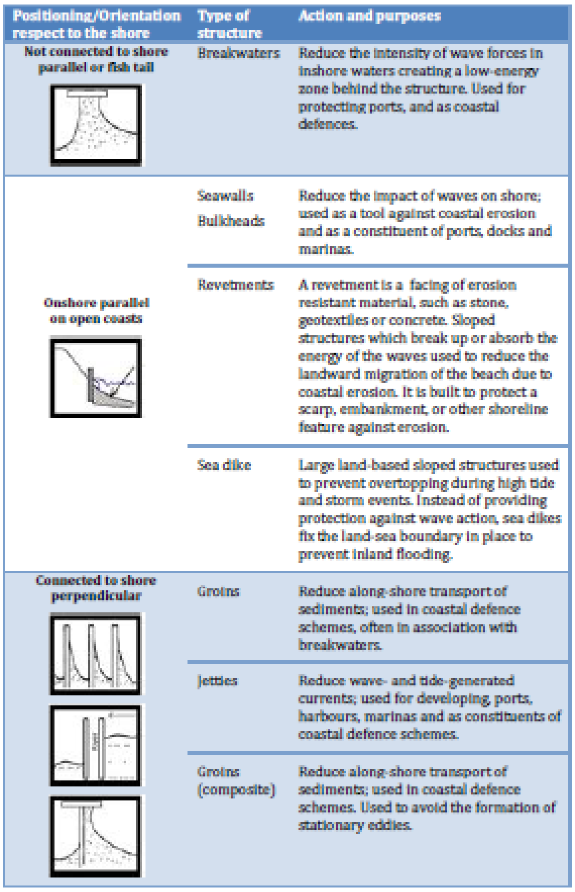
With regard to the coastline to be considered: the fixed reference official coastline as defined by responsible Contracting Party should be considered. The optimal resolution should be 5 m or 1: 2000 spatial scale.

Once a proper geographic scale has been established, monitoring should focus, in particular, on the location, the spatial extent and the types of coastal structures taking into account the minimum coastal length that can be classified as artificial or natural.

The identification procedure of human-made structures should be carried on based on typical situations added to the indicator guidance factsheet, including the minimum size (length, width of human-made structures) to be taken into account.

As monitoring should be done every 6 years, every CP should fix a reference year in the time interval 2000-2012 in order to eliminate the bias due to old or past human-made infrastructures.

Ecological Objective 8:	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	Length of coastline subject to physical disturbance due to the influence of human-made structures



Positioning/Orientation respect to the shore	Type of structure	Action and purposes
Not connected to shore parallel or fish tail	Breakwaters	Reduce the intensity of wave forces in inshore waters creating a low-energy zone behind the structure. Used for protecting ports, and as coastal defences.
Onshore parallel on open coasts	Seawalls Bulkheads	Reduce the impact of waves on shore; used as a tool against coastal erosion and as a constituent of ports, docks and marinas.
	Revetments	A revetment is a facing of erosion resistant material, such as stone, geotextiles or concrete. Sloped structures which break up or absorb the energy of the waves used to reduce the landward migration of the beach due to coastal erosion. It is built to protect a scarp, embankment, or other shoreline feature against erosion.
	Sea dike	Large land-based sloped structures used to prevent overtopping during high tide and storm events. Instead of providing protection against wave action, sea dikes fix the land-sea boundary in place to prevent inland flooding.
Connected to shore perpendicular	Groins	Reduce along-shore transport of sediments; used in coastal defence schemes, often in association with breakwaters.
	Jetties	Reduce wave- and tide-generated currents; used for developing ports, harbours, marinas and as constituents of coastal defence schemes.
	Groins (composite)	Reduce along-shore transport of sediments; used in coastal defence schemes. Used to avoid the formation of stationary eddies.

Figure 1. Hard coastal defence structures, modified from the EUROSION Shoreline Management Guide, EU, 2004. Taken from IMAP guidelines, page 134, Table 1.

Indicator units

- Km of artificial coastline and % of total length of coastline.
- Percentage (%) of natural coastline on the total coastline length.

The length of artificial coastline should be calculated as the sum of segments on reference coastline identified as the intersection of polylines representing human-made structures with reference coastline ignoring polylines representing human-made structures with no intersection with reference coastline. The minimum distance between coastal defence structures should be set to 10 m in order to classify such segments as natural, i.e. if the distance between two adjacent coastal defence structures is less than 10 m, all the segments including both coastal defence structures is classified as artificial.

List of Guidance documents and protocols available

Monitoring and assessment methodological guidance on EO8: coastal ecosystems and landscapes (within IMAP guidelines)

EUROSION Shoreline Management Guide (European Commission and Directorate General Environment, 2004, Annex 2)

Ecological Objective 8:	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	Length of coastline subject to physical disturbance due to the influence of human-made structures

Data Confidence and uncertainties

Regarding data confidence, both geographic scale and resolution of images have to be properly selected depending on type and density of coastal human-made structures. A specific cost/benefit analysis has to be carried on choosing the right balance among resolution, an acceptable level of uncertainties and the necessity to assure comparability of results at Mediterranean level.

Methodology for monitoring, temporal and spatial scope

Available Methodologies for Monitoring and Monitoring Protocols

Space and airborne earth observation systems are the most suitable tool to conduct the monitoring strategy of the EO8 common indicator, i.e. very high resolution (VHR) satellite imagery, aerial photographs, laser scanners etc. Beyond earth observation data, identification techniques and procedures used through GIS tools also have to be described**.**

Available data sources

CORINE land cover, national spatial plans, World Imagery Basemap feature (in ArcGIS 10.1), Landsat satellite imagery, Google earth, aerial photographs surveys.

Spatial scope guidance and selection of monitoring stations

The exact territorial extent of the monitoring should be presented.

The optimum spatial scale for a proper identification of human-made structures should be 5 m by satellite imagery or aerial photographs.

Temporal Scope guidance

Monitoring human-made structures data should be updated at least every 6 years, while shoreline survey of sandy coastline under anthropogenic pressure should be, if possible, repeated annually (at the same time of the year).

Data analysis and assessment outputs

Statistical analysis and basis for aggregation

The total length of coastline estimated as being subjected to physical disturbance due to the influence of human-made structures should be summed up. In addition, the share of this coastline in total country's coastline should be determined. If an official coastline is available, i.e. an institutional body provides a GIS polyline, then such coastline can be used to “project” the identified human-made structures in order to classify parts of the coastline as being subjected to physical disturbance due to the influence of human-made structures. Geographic scale of maps and cartography used to identify human-made structures could be different but not too much form the ones used for the official coastline. In case if such official coastline is not available or its geographic scale is too coarse with respect to one needed to properly identify human-made structures, then coastline will be defined by the same maps/cartography used for human-made structures identification.

Expected assessments outputs

The total length of coastline influenced by human-made structures and the share of this coastline in total country’s coastal length should be provided on a map showing the coastline subject to physical disturbance due to human-made structures (artificial segments) in red line and the rest (natural segments) in green line.

The assessment output should be reported as a common shape file format with GRS as WGS84.

Shapefiles with other GRS will also be accepted if provided with a complete .prj file that allows GRS transformations by standard GIS tools.

Ecological Objective 8:	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	Length of coastline subject to physical disturbance due to the influence of human-made structures

Known gaps and uncertainties in the Mediterranean

In order to implement EO8 indicator with an acceptable level of accuracy, recent data sources with proper spatial resolution and complete coastline coverage should be used jointly with adequate GIS tools and expert team.

Capacity building can be readily assessed for each CP as such resources are generally available for the Mediterranean Region also taking into account the increasing efforts on satellite imagery products (ESA Sentinels constellation). So, once a common framework of data sources, GIS procedures and way of representing the output of EO8 indicator are agreed, a common implementation work for all CPs could be in principle settled down.

Contacts and version Date

Key contacts within UNEP/MAP for further information

Version No	**Date**	**Author**
V.1	27/6/16	PAP/RAC & Giordano Giorgi
V.2	27/7/16	Giordano Giorgi
V.3	23 March 2018	PAP/RAC
V.4	15/04/2025	PAP/RAC

Appendix 6

Guidance Factsheet for Common Indicator 25

Guiding Factsheet for the Common Indicator 25 *Land cover change*

Ecological Objective	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved	
Indicator Title	*Land cover change*	
Relevant GES definition	**Related Operational Objective**	**Proposed Target(s)**
- *Linear coastal development and low-lying terrain coastal development minimised, with perpendiculardevelopment being in balancewith integrity and diversity of coastal ecosystems and landscapes.* - *Mixed land-use structure achieved in predominantly human-made coastal landscapes*	*Integrity and diversity of coastal ecosystems, landscapes and their geomorphology are preserved.*	*Proposed targets should be considered as general recommendations to be adapted to regional/local specificities and knowledge.* - *No further construction within the setback zone and avoid further construction in low-lying coastal terrain* - *Change of coastal land use structure, dominance of urbanland use reversed* - *Keep, and increase landscape diversity*

GES, targets and measures cannot be expressed quantitatively (as a threshold value) but due to country specific circumstances (socio-economic, cultural, historical) should be defined by the countries themselves. In doing so the CPs should take their spatial development and planning policies into account, as well as the legal obligations of the Barcelona Convention, in particular theICZM Protocol. The above GES definition and Proposed target(s) are just examples.

Rationale

Justification for indicator selection

The UNEP/MAP's Correspondence Group on Monitoring (CORMON) on Coast and Hydrography agreed, in May 2013, on a specific candidate common indicator for the Mediterranean region addressing land cover change.

Identifying and understanding the processes of land cover change (i.e. how land cover has been changed by humans and the processes that result in landscape transformation) is especially relevantfor critical and vulnerable areas such as coastal zones, where several competitive uses are pressing. In this context urbanization, or land take, is the most dramatic change given the (almost) irreversibilityof the process. The associated impacts could be listed as follows (Figure 1):

- *Habitat loss with the associated impact on related ecosystem functions like C sequestration, regulation of water cycle, or biomass production.*
- *Fragmentation. The division of natural habitats in smaller parcels contributes to the isolationof number of species and also compromises its viability.*

Therefore, the accumulated impacts of urbanization including infrastructures (harbours, roads, rail trucks, airports, etc.) highly compromise ecosystem integrity. Since impacts are dependent on the scale and pace of changes it is important to consider these aspects when monitoring land cover changes.

Ecological Objective	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	*Land cover change*

Beyond the process of urbanization there are other changes that are less irreversible and also have important consequences:

- *Conversion from forest to agricultural use. This results in habitat loss, habitat fragmentation and, consequently, loss of biodiversity. There is also a decrease on the degree of soil coverage by vegetation which in turn determines the risk of erosion. Also, this type of change results in a net loss of soil carbon.*
- *Conversion from agriculture to semi-natural. The impact strongly depends on the conditions at the time of abandonment. If conditions are favorable, land abandonment can lead to a recovery of natural vegetation. However, in case of unfavorable conditions like low vegetation coverage and/or steep slope, agricultural abandonment could lead to further land degradation.*
- *Conversion from agricultural land to forest (forestation). This change involves tree plantation and it has a positive impact on land stability by increasing the vegetation cover of the soil and the increase of C sequestration. In terms of biodiversity it strongly depends on the species used for plantation. Native species definitely increase diversity and connectivity.*

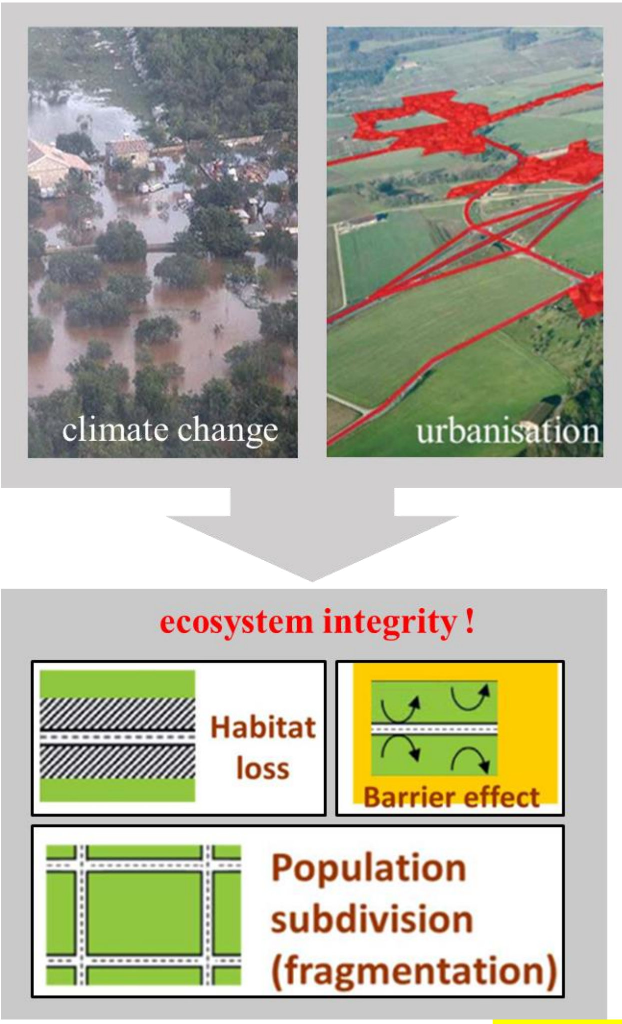


Figure 1. ***Overview of major impacts on coastal habitats***

In the context of climate change, low-lying coastal terrain is prone to coastal flooding, erosion and

Ecological Objective	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	*Land cover change*

salinization. The associated impacts could be listed as follows (Figure 2):

- *Loss of coastal habitats, including wetlands, deltas, mangroves and beaches;*
- *Physical disturbance and hydrographic alterations;*
- *Loss of currently dry land habitats due to advancing seas;*
- *Disruption and destruction of shorebird and sea turtle nests;*
- *Population declines in fishes, shellfish and other species that rely on coastal wetlands for at least part of their lives;*
- *Population declines in migratory birds that rely on coastal habitats during seasonal migrations.*

When preparing coastal adaptation plans to climate change priority should be given to low-lying coastal zone.

Scientific References

References are grouped by the topic addressed. Within each section references are sorted byrelevance (the first ones are more relevant to the current indicator)

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Ecological Objective	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	*Land cover change*

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Policy Context

Ecological Objective	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	*Land cover change*

Policy context description

After agreeing on including the candidate common indicator on Land use change in CORMON on Coast and Hydrography in 2013, it was decided that this candidate common indicator would need further testing, pilot implementation (including during the initial phase of IMAP), before the Contracting Parties could agree to its regional usage as a common indicator.

In order to follow-up on this CORMON Coast and Hydrography recommendation, an EcAp pilot project took place in the Adriatic to test the feasibility of this candidate common indicator on the sub-regional level, in the framework of an EU funded project on the "Implementation of the Ecosystem Approach in the Mediterranean by the Contracting Parties in the context of the Barcelona Convention for the Protection of the Marine Environment and the Coastal region of the Mediterranean and its Protocols (EcAp-MED project 2012-2015)". The main conclusions of the Pilot project suggest that by using the common remote data and a common method for processing and presenting the results are feasible and a very positive step forward as far as monitoring the processes, the state and evolution of the coastal zones.

The results of this pilot are presented in document UNEP(DEPI)/MED WG.420/Inf.18.

The EcAp Coordination Group meeting held in September 2019 approved elaboration on the proposal for the upgrading of the common indicator on Land use change within the GEF Medprogramme project.

The results of elaboration and testing are presented in PAP/RAC documents (2022): Upgraded LCC Indicator 25 proposal; Report and GIS database with calculation of the LCC indicator for the pilot areas; Validation of testing results for upgraded LCC Indicator 25 in pilot areas.

As for the protocols of the Barcelona convention, the ICZM protocol identifies the need of balanced use of coastal zones in several articles.
*For example, the **Article 5** sets the objectives of integrated coastal management:*

(a) to facilitate, through the rational planning of activities, the sustainable development of coastal zones by ensuring that the environment and landscapes are taken into account in harmony with economic, social and cultural development;
(b) preserve coastal zones for the benefit of current and future generations;
(c) ensure the sustainable use of natural resources, particularly with regard to water use;
(d) ensure preservation of the integrity of coastal ecosystems, landscapes and geomorphology;

*In **Article 6**, where general principles of ICZM are discussed, it is highlighted that the formulation of land use strategies, plans and programs covering urban development and socioeconomic activities, as well as other relevant sectoral policies, shall be required (f). In addition, the Article 6 calls for the allocation of uses throughout the entire coastal zone to be balanced, and unnecessary concentration and urban sprawl to be avoided(h).*

*The **Article 8** calls to Contracting Parties to ensure that their national legal instruments include criteria for sustainable use of the coastal zone. Some of such criteria ask for "identifying and delimiting, outside protected areas, open areas in which urban development and other activities are restricted or, where necessary, prohibited" (a). In addition, it asks for limiting the linear extension of urban development and the creation of new transport infrastructure along the coast(b).*

*In addition, the **EU's Habitats Directive** (92/43/EEC), **Birds Directive** (2009/147/EC), as well as **Convention of Biological Diversity** can also be relevant for policy context regarding land cover change.*

Ecological Objective	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	*Land cover change*

Necessity to actively mainstream climate resilience considerations in all relevant policy fields is stressed in the ***EU Strategy on Adaptation to Climate Change****. The European Commission stresses the implementation of adaptation strategies and plans at all levels of governance, particularly including three cross cutting priorities: integrating adaptation into macro-fiscal policy, nature-based solutions for adaptation, and local adaptation action.*

The EU's 8th Environment Action Programme (EAP) to 2030 (*Decision (EU) 2022/591) set out thematic priority objectives in areas of climate change mitigation, adaptation to climate change, protecting and restoring terrestrial and marine biodiversity, a non-toxic circular economy, a zero-pollution environment and minimising environmental pressures from production and consumption across all sectors of the economy. The EU's 8th EAP to 2030 is relevant for coastal zones management in the context of climate change.*

The ***paragraph 32*** *highlights degradation of marine and coastal ecosystems through harmful practices, pollution and processes such as eutrophication and acidification, and asks for urgent action to protect and restore marine and coastal ecosystems, including the ocean floor. In addition, it states that environmental degradation and the adverse effects of climate change are expected to increase further in the years to come, impacting the hardest on developing countries and vulnerable populations.*

In order to help build resilience and support third countries in their efforts to mitigate, and adapt to climate change, as well as to protect biodiversity, ***Article 33*** *proposes that financial assistance from the Union and Member States to third countries should promote the* ***UN 2030 Agenda****,* ***the Paris Agreement*** *and the post-2020 global framework of the* ***UN Convention on Biological Diversity*** *and be in line with the priority objectives of the 8th EAP.*

In addition, integrated costal management is expressly mentioned in Art 7 of marine spatial planning Directive (2014/89/EU), where there is an obligation to take land-sea interaction into account, and then if there are other planning processes the Member States shall aim to "promote coherence" between them.

Targets

- *No construction within the setback zone and avoid further construction in low-lying coastal terrain*
- *Change of coastal land use structure, dominance of urban land use reversed*
- *Keep, and increase landscape diversity*

Interpretation of targets and setting the measures to achieve them should be left to the countries. The reason is the strong socio-economic, historic and cultural dimensions in addition to specific geomorphological and geographical conditions in each country. In other words: although the indicatoris a simple tool to show trends in land-cover changes for interpretation purposes, additional criteria should be taken into account i.e. due to strong socio-economic, historic and cultural dimensions in addition to specific geomorphological and geographical conditions the interpretation should be left tothe countries.

These targets should be taken as general guidelines that need to be considered in light with the local knowledge. Given the relevance of the socio-economic, historic and cultural dimension, in addition to specific geographical conditions, local experts will provide the needed input in support to this indicator.

Ecological Objective	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	*Land cover change*

Policy documents

ICZM Protocol (available in different languages at
http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A22009A0204(01)) *Convention on Biological Diversity (www.cbd.int)*
Habitats Directive (92/43/EEC)
http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043

Birds Directive (2009/147/EC)
http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0147

Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change
https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021DC0082&from=EN

The EU's 8th Environment Action Programme to 2030
https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022D0591

Biodiversity Strategy for 2030 Bringing nature back into our lives (COM/2020/380)
https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0380&qid=1633372990508

Marine Spatial Planning Directive (2014/89/EU)
https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0089&from=EN

Indicator analysis methods

Indicator Definition

Land use/land cover change is the change of purpose to which land is profited by humans (e.g., protected areas, forestry for timber products, plantations, row-crop agriculture, pastures, or human settlements). Different parameters can be considered for evaluation of indicator on land use/land cover change. The parameters are summed in Table 1. The combined analysis of these parameters entails an inventory of the urbanization pressures on coastal ecosystems. In practice the parameterscan identify: (i) where pressures are higher (by amount of change and by pace of the process); (ii) spatial trends (along the coast and landwards and in low-lying coastal terrain); and (iii) areas for priority action. However, responsible (local) institutions are necessary to correctly interpret these processes and to understand the drivers behind them.

Table 1. ***Description of the parameters calculated for the indicator Land Cover Change***

Ecological Objective	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved			
Indicator Title	*Land cover change*			
Parameter	*Units*	*Data required*	*Reporting units*	*Meaning*
Area of built-up land in coastal zone as a proportion of the total area in the same unit	*% of artificial areas*	*Artificial surfaces ata single time shot*	*Coastal zone asdefined by the country Also coastal strips (<300m*, 300m-1km, 1-10 km). Also low-elevation coastal zone (LECZ)**.*	*State of urban areas at a particular time. This is used as a baseline, i.e. initial conditionfor the analysis of changes.*
Area of built-up land in coastal units as a proportion of the area of built-up land in the wider coastal unit	*% of artificial areas*	*Artificial surfaces ata single time shot*	*Coastal strips within coastal zone.*	*This parameter shows in which coastal strip the process of urbanisation is the most intensive. It also reflects the relevance of economic activities on the coast as a driver of urban development.*
Land take as % initial urban area on the coastal zone	*% of increase of urban areas*	*Artificial surfaces at t0 and t1*	*Coastal zone asdefined by the country. Also coastal strips (<300m*, 300m-1km, 1-10 km) Also low-elevation coastal zone (LECZ). Also protected areas.*	*Intensity of the process of urbanization in a given period of time.*
Change of forest and semi-natural areas	*% of change of forest and semi-natural areas*	*Forest and semi-natural land at t0 and t1*	*Coastal zone as defined by the country. Also coastal strips (<300m*, 300m-1km, 1-10 km) Also low-elevation coastal zone (LECZ).*	*This parameter would reflect to what extent management is leading to an increase, maintenance or decrease of forest and semi-natural areas. This represents the land cover closer to "natural land" excluding wetlands (specific indicator).*
Change of wetlands	*% of change of wetlands*	*Wetlands at t0 and t1*	*Coastal zone as defined by the country. Also coastal strips (<300m*, 300m-1km, 1-10 km) Also low-elevation coastal zone (LECZ).*	*This parameter will indicate how effective is the protection of wetlands, (including deltas) in terms of coverage. The indicator could reflect and increase, maintenance or a decrease of wetlands.*
Change of protected areas	*% of change of protected areas*	*Protected areas at t0 and t1*	*Coastal zone as defined by the country. Also coastal strips (<300m*, 300m-1km, 1-10 km) Also low-elevation coastal zone (LECZ).*	*This parameter shows how the extent of protected areas changes in time.*

**the 300m wide coastal strip is proposed as relevant representation of the coastal setback (alsoconsidering the resolution issues)*
*** Low Elevation Coastal Zone (LECZ) is an area within the coastal zone potentially prone to future risks caused by climate change: sea level rise, coastal flooding, erosion and salinization. LECZ should be constructed as area contiguous to the coast and below elevation threshold. For the Mediterranean region, 5 m above sea level is recommended elevation threshold. Within this zone, each country can implement country-specific measures to cope with the risks based on the most relevant climate change scenario for the country.*

Ecological Objective	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	*Land cover change*

Methodology for indicator calculation

1. Data compilation - *Land cover classes are typically mapped from digital remotely sensed data through the process of a supervised digital image classification or, alternatively, determined by in situ monitoring. Land cover classes needed for the indicator are based on the Land Cover Classification System (LCCS) developed by the United Nations (UN) Food and Agriculture Organization (hereinafter UN-LCCS system). Level 1 of the UN-LCCS system is sufficient for the indicator's land cover classes and they are listed in the Table 2. If more detailed classification is available, then it could be provided making the clear link with Table 2.*

Table 2. Land cover classes for the Land Cover Change indicator

LU/LC class	*UN-LCCS classes (code and description)*
Artificial surfaces (also referred as built-up areas)	***50 Urban/Built-up*** *Land covered by buildings and other human-made structures.* *Urban green (parks, sport facilities) is not included in this class. Waste dump deposits and extraction sites are considered as bare.*
Agricultural	***40 Cultivated and managed vegetation/agriculture (cropland)*** *Lands covered with temporary crops followed by harvest and a bare soil period (e.g., single and multiple cropping systems). Greenhouses are considered as built-up.*
Forest and semi-natural land	***10 Forest/Tree cover*** *Closed (tree canopy >70 %) / open forests (tree canopy 15-70%), evergreen/deciduous, needle/broad leaf, mixed. Plantation (e.g. olive trees and orchards) are included in this class.* ***20 Shrubs*** *These are woody perennial plants with persistent and woody stems and without any defined main stem being less than 5 m tall. The shrub foliage can be either evergreen or deciduous. Vineyards are included in this class.* ***30 Herbaceous vegetation/grasslands*** *Plants without persistent stem or shoots above ground and lacking definite firm structure. Tree and shrub cover is less than 10 %. Irrespective of different human and/or animal activities, such as: grazing, selective fire management etc. It may also contain uncultivated cropland areas (without harvest/ bare soil period) in the reference year.* ***60 Bare / sparse vegetation*** *Lands with exposed soil, sand, or rocks and never has more than 10 % vegetated cover during any time of the year.* ***70 Snow and Ice*** *Lands under snow or ice cover throughout the year.* ***100 Moss and lichen*** *Moss and lichen*
Wetlands	***90 Herbaceous wetlands*** *Lands with a permanent mixture of water and herbaceous or woody vegetation. The vegetation can be present in either salt, brackish, or fresh water.* ***95 Mangroves***
Water bodies	***80 Permanent water bodies*** *Lakes, reservoirs, and rivers. Can be either fresh or salt-water bodies.* ***200 Open sea*** *Oceans, seas. Can be either fresh or salt-water bodies.*

Ecological Objective	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	*Land cover change*

2. Protected areas
Surfaces with any of the protection status (such as Natura 2000, IUCN or national-specific categories with the objectives to protect biodiversity, habitats, species, landscapes and alike in the coastal zone).

3. Data processing
Data processing includes the following steps (Figure 2):

(i) Pre-processing
Land cover data could be available in two formats: vector data (polygons) or raster data (grid). For practical reasons, and to simplify the computing process, the first step is to ensure that all the data is in a grid of 1 ha or smaller. Conversion of vector data to a grid, or raster, is a common procedure in GIS techniques. Most of the GIS software provides different options to convert vector data into a grid. Here the 'Maximum area' criterion is suggested as one of the most standard methods.

(ii) Combining data
Once the data is available in 1 ha or smaller grid, the different layers are combined. This process is automatically done by any GIS software and creates an associated table with all the information available for each cell in the grid. The layers to be combined are listed as follows:

1. *Baseline land cover data (y0).*
2. *Land cover change data (y0-y1).*
3. *Delimitation of coastal zone and strips.*
4. *Delimitation of protected areas.*
5. *Delimitation of Low Elevation Coastal Zone.*

Therefore, the minimum information that the resulting table should contain is as follows:

1. *Grid ID. Unique identifier for each cell in the grid of 1 ha.*
2. *Coastal zone. Yes/No. Boolean parameter that indicates if the cell is within the coastal zone, as defined by the country.*
3. *Coastal strip 0-300 m. Yes/No. Boolean parameter that indicates if the cell is within the coastal strip.*
4. *Coastal strip 300 m – 1 km. Yes/No. Boolean parameter that indicates if the cell is within the coastal strip.*
5. *Coastal strip 1 km – 10 km. Yes/No. Boolean parameter that indicates if the cell is within the coastal strip.*
6. *Protected area at t_0. Yes/No. Boolean parameter that indicates if the cell is within the protected area.*
7. *Protected area at t_1. Yes/No. Boolean parameter that indicates if the cell is within the protected area.*
8. *Low Elevation Coastal Zone. Yes/No. Boolean parameter that indicates if the cell is within the Low Elevation Coastal Zone.*
9. *Land cover class at t0. Code for the land cover class of the cell.*
10. *Land cover class at t1. Code for the land cover class of the cell.*

(iii) extracting statistics
As a result of the previous step a table should be available with the unique code of each cell of the 1ha grid and all related parameters. Therefore, the extraction of the statistics for the calculation of the indicator could be done in a spreadsheet and does not require any GIS processing (see Data analysis and assessment outputs section for the details).

Detailed description of the calculation for the Land Cover Change indicator using open-source

Ecological Objective	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	*Land cover change*

software is given in the Manual for calculating IMAP Common Indicator 25, Report; PAP/RAC, Split, Croatia (Gilić F. 2022).

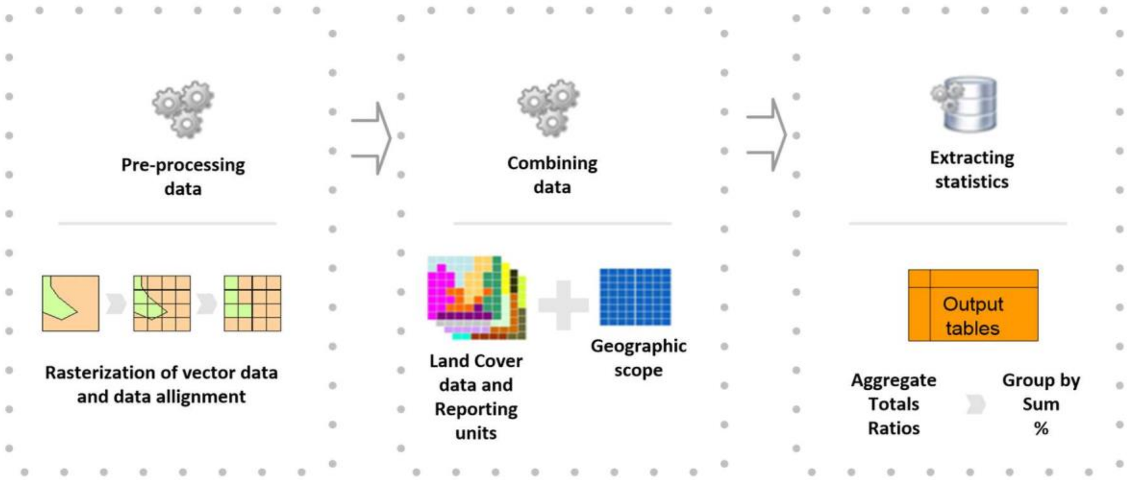

Figure 2. ***Data processing for the Land Cover Change indicator***

Indicator units

The first monitoring will focus on the baseline. The indicator units are indicated below:

1. *km² of built-up area in coastal strips/coastal zone;*
2. *% of built-up area in coastal strips/coastal zone;*
3. *% of other land cover classes in coastal strips/ coastal zone;*
4. *% of built-up area within coastal strips of different width (see Table 1) compared to coastal zone;*
5. *% of other land cover classes within coastal strips of different width (see Table 1) compared to coastal zone;*
6. *km² of protected areas within coastal strips/coastal zone;*
7. *km² of built-up area within protected areas;*
8. *% of built-up area within protected areas;*
9. *km² of LECZ within coastal strips/coastal zone;*
10. *km² of built-up area within LECZ;*
11. *% of built-up area within LECZ;*
12. *% of other land cover classes within LECZ;*
13. *km² of protected areas within LECZ.*

For second monitoring the following units will also be relevant:

14. *% of increase of built-up area, or land take in coastal strips/coastal zone;*
15. *% of change of other land cover classes in coastal strips/coastal zone;*
16. *% of change of protected areas in coastal strips/coastal zone;*
17. *% of increase of built-up area, or land take within protected areas;*
18. *% of increase of built-up area, or land take within LECZ;*
19. *% of change of other land cover classes within LECZ;*
20. *% of change of protected areas within LECZ.*

Ecological Objective	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	*Land cover change*

List of Guidance documents and protocols available

Pilot project in the Adriatic on testing the candidate common indicator 'Land use change' in the Mediterranean, by: Anna Marín. Raquel Ubach. and JaumeFons-Esteve. Coordinated by: Marko Prem, PAP/RAC. URL: http://www.pap- thecoastcentre.org/pdfs/Pilot%20Adriatic_Final_Sep2015.pdf

Upgraded LCC Indicator 25 proposal. Report; PAP/RAC, Split, Croatia (Baučić M., Morić Španić A., Gilić F. 2022)

Report and GIS database with calculation of the LCC indicator for the pilot areas. Report; PAP/RAC, Split, Croatia (Baučić M., Morić Španić A., Gilić F. 2022)

Validation of testing results for upgraded LCC Indicator 25 in pilot areas. Report; PAP/RAC, Split, Croatia (Baučić M., Morić Španić A., Gilić F. 2022)

Manual for calculating IMAP Common Indicator 25, Report; PAP/RAC, Split, Croatia (Gilić F. 2022)

Data confidence and uncertainties

Production of land use/land cover data from remote sensing is always a compromise between precision and efforts required to derive the information from satellite images. The data sources listed below (see Available data sources) have been validated by the responsible institutions or providers of the data. Additionally, if analogue maps from official institutions are available they could be digitalised and used accordingly.

Quality assurance/control always involve a selection of percentage of points where the derivedinformation is checked against "ground truth" –usually ancillary information like official maps,cadastre,... but also field inspections.

Validation of testing results for upgraded LCC Indicator 25 in pilot areas. Report; PAP/RAC, Split, Croatia (Baučić M., Morić Španić A., Gilić F. 2022)

Methodology for monitoring, temporal and spatial scope

Available Methodologies for Monitoring and Monitoring Protocols

The most elaborated guidelines are available from the Corine Land Cover programme (currentlyintegrated in the Copernicus Programme).

http://www.eea.europa.eu/publications/technical_report_2007_17

Ecological Objective	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	*Land cover change*

Available data sources

The data sources listed below are open global data bases (free for use). The report "Validation of testing results for upgraded LCC Indicator 25 in pilot areas. Report; PAP/RAC, Split, Croatia (Baučić M., Morić Španić A., Gilić F. 2022)" has proved their use. In the case where national datasets (official) are available as more updated and with better resolution, these should be used instead of open-source datasets proposed.

ESA WorldCover Project Land cover:
WorldCover provides a global land cover product at 10 m resolution for 2020 and 2021 based on Sentinel-1 and 2 data. The ESA WorldCover product is provided free of charge, without restriction of use. https://esa-worldcover.org/en

OpenStreetMap (OSM) data:
OpenStreetMap (OSM) is based on crowdsourced volunteered geographic information, it is often being used as a valuable data source for extracting useful information. OSM coastline can be downloaded from https://osmdata.openstreetmap.de/. Administrative boundaries from https://osm-boundaries.com/.
Copernicus DEM 30:
Copernicus DEM is a digital surface model (DSM) in resolution of 30 m, it has world cover and is freely available, https://land.copernicus.eu/global/content/annual-100m-global-land-cover-maps-available

***World Database on Protected Areas**:*
World Database on Protected Areas is the most exhaustive global database on terrestrial and marine protected areas, managed by UNEP World Conservation Monitoring Centre (UNEP-WCMC) and is being updated on a monthly basis *https://www.protectedplanet.net/en/thematic-areas/wdpa?tab=WDPA.*

Spatial scope guidance and selection of monitoring stations

The exact territorial extent (coastal area for the analysis) of the monitoring should be defined. The Mediterranean ICZM Protocol defines the landward limit of coastal zone as the "limit of the competent coastal units as defined by the Parties (Article 3)." In other words, the landward limit will be country-specific, e.g. dependant on definition given by certain Contracting party when ratifying the Protocol.

As for the resolution of the source data it is a „compromise between precision and efforts needed in processing the satellite images. The following indications could be considered minimum requirements:

- *Minimum mapping unit of 1 ha and 100 m of linear elements*
- *Minimum change detection 1 ha*

Temporal Scope guidance

The temporal scale should be 6 years, in order to be effective on the counteracting negative effectsand taking early actions on problematic areas. That will ensure complementarity with the cycle of the monitoring of CI 16 and the QSR preparation.

Data analysis and assessment outputs

Ecological Objective	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	*Land cover change*

Statistical analysis and basis for aggregation

The statistics can be computed as follows (assuming that 1 cell equals 1 ha):

1. *Percentage of built-up area in coastal zone/coastal strips.*
   a) *Filter the data by the grids belonging to the coastal zone/coastal strips.*
   b) *Calculate total area by counting the total number of cells. This is the area in ha.*
   c) *Filter, within the coastal zone/coastal strip, by land cover "artificial areas" (see Table 2 for the definition of land cover classes).*
   d) *Calculate area of "artificial areas" by counting the number of cells. This is the area in ha.*
   e) *Divide 1d by 1b in order to obtain the percentage of artificial area on the coastal zone/coastal strip.*

2. *Percentage of other land cover classes on the coastal zone/coastal strip. As complementary to "Percentage of built-up area in coastal zone" the same procedure could be applied to eachland cover class as defined in Table 2. In that case the procedure described in 1 will be replicated by changing "artificial areas" with the other land cover classes.*

3. *Area of built-up land in coastal strip as a proportion of the area of built-up land in the coastal zone.*
   a) *Divide 1d calculated for coastal strip by 1d calculated for coastal zone. This value is the percentage of built-up land in the coastal zone that is located inside the coastal strip.*
   b) *Replicate the procedure described in a) for each coastal strip.*

4. *Percentage of built-up area in protected areas.*
   a) *Filter the data by the grids belonging to the protected area.*
   b) *Calculate total area by counting the total number of cells. This is the area in ha.*
   c) *Filter, within protected area, by land cover "artificial areas" (see Table 2 for the definition of land cover classes).*
   d) *Calculate area of "artificial areas" by counting the number of cells. This is the area in ha.*
   e) *Divide 4d by 4b in order to obtain the percentage of artificial area in the protected area.*

5. *Percentage of built-up area in LECZ.*
   a) *Filter the data by the grids belonging to the LECZ.*
   b) *Calculate total area by counting the total number of cells. This is the area in ha.*
   c) *Filter, within LECZ, by land cover "artificial areas" (see Table 2 for the definition of land cover classes).*
   d) *Calculate area of "artificial areas" by counting the number of cells. This is the area in* km^2.
   e) *Divide 5d by 5b in order to obtain the percentage of artificial area on the LECZ.*

6. *Percentage of other land cover classes on the LECZ. As complementary to "Percentage of built-up area in LECZ" the same procedure could be applied to each land cover class as defined in Table 2. In that case the procedure described in 5 will be replicated by changing "artificial areas" with the other land cover classes.*

7. *Percentage of protected area in LECZ.*
   a) *Filter the data by the grids belonging to LECZ.*
   b) *Calculate total area by counting the total number of cells. This is the area in ha.*
   c) *Filter, within the LECZ, by protected areas.*
   d) *Calculate area of "protected areas" by counting the number of cells. This is the area in ha.*
   e) *Divide 7d by 7b in order to obtain the percentage of protected area on the LECZ.*

8. *Land take as % of initial urban area on the coastal zone/coastal strip. This parameter will start to*

Ecological Objective	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	*Land cover change*

be computed on the second monitoring since the first monitoring focus only on the baseline(state at t0).

- a) *Filter the data by the grids belonging to the coastal zone/coastal strip.*
- b) *Calculate total area by counting the total number of cells. This is the area in ha.*
- c) *Filter, within the coastal zone/coastal strip, by land cover "artificial areas" (see Table 2 for the definition of land cover classes) for t0.*
- d) *Filter, within the coastal zone/coastal strip, by land cover "artificial areas" (see Table 2 for the definition of land cover classes) for t1.*
- e) *Calculate 8d-8c and then divide by 8c. This provides the percentage of land take compared to the initial built-up area.*

9. *Change of forest and semi-natural land. This parameter will start to be computed on the second monitoring since the first monitoring focus only on the baseline (state at t0).*
   - a) *Filter the data by the grids belonging to the coastal zone/coastal strip.*
   - b) *Calculate total area by counting the total number of cells. This is the area in ha.*
   - c) *Filter, within the coastal zone/coastal strip, by land cover "Forest and semi-natural land" (see Table 2 for the definition of land cover classes) for t0. Calculate area by counting the total number of cells. This is the area in ha.*
   - d) *Filter, within the coastal zone/coastal strip, by land cover "Forest and semi-natural land" (see Table 2 for the definition of land cover classes) for t1. Calculate area by counting the total number of cells. This is the area in ha.*
   - e) *Calculate 9d-9c and then divide by 9c. This provides the percentage of change of forest and semi-natural areas for the given period.*

10. *Change of wetlands. This parameter will start to be computed on the second monitoring since the first monitoring focus only on the baseline (state at t0).*
    - a) *Filter the data by the grids belonging to the coastal zone/coastal strip.*
    - b) *Calculate total area by counting the total number of cells. This is the area in ha.*
    - c) *Filter, within the coastal zone/coastal strip, by land cover "Wetlands" (see Table 2 for the definition of land cover classes) for t0. Calculate area by counting the total number of cells. This is the area in ha.*
    - d) *Filter, within the coastal zone/coastal strip, by land cover "Wetlands" (see Table 2 for the definition of land cover classes) for t1. Calculate area by counting the total number of cells. This is the area in ha.*
    - e) *Calculate 10d-10c and then divide by 10c. This provides the percentage of change of wetlands for the given period.*

11. *Change of protected area. This parameter will start to be computed on the second monitoring since the first monitoring focus only on the baseline (state at t0).*
    - a) *Filter the data by the grids belonging to the protected area for t_0.*
    - b) *Calculate total area by counting the total number of cells. This is the area in ha.*
    - c) *Filter the data by the grids belonging to the protected area for t_1.*
    - d) *Calculate total area by counting the total number of cells. This is the area in ha.*
    - e) *Calculate 11d-11b and then divide by 111b. This provides the percentage of change of protected area for the given period.*

12. *Land take as % of initial urban area in the protected area. This parameter will start to be computed on the second monitoring since the first monitoring focus only on the baseline(state at t0).*
    - a) *Filter the data by the grids belonging to the protected area.*
    - b) *Calculate total area by counting the total number of cells. This is the area in ha.*
    - c) *Filter, within the protected area, by land cover "artificial areas" (see Table 2 for the*

Ecological Objective	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	*Land cover change*

definition of land cover classes) for t0. Calculate area by counting the total number of cells. This is the area in ha.

d) Filter, within the protected area, by land cover "artificial areas" (see Table 2 for the definition of land cover classes) for t1. Calculate area by counting the total number of cells. This is the area in ha.

e) Calculate 12d-12c and then divide by 12c. This provides the percentage of land take compared to the initial built-up area.

13. Land take as % of initial urban area on the LECZ. This parameter will start to be computed on the second monitoring since the first monitoring focus only on the baseline(state at t0).

a) Filter the data by the grids belonging to the LECZ.

b) Calculate total area by counting the total number of cells. This is the area in ha.

c) Filter, within the LECZ, by land cover "artificial areas" (see Table 2 for the definition of land cover classes) for t0. Calculate area by counting the total number of cells. This is the area in ha.

d) Filter, within the LECZ, by land cover "artificial areas" (see Table 2 for the definition of land cover classes) for t1. Calculate area by counting the total number of cells. This is the area in ha.

e) Calculate 13d-13c and then divide by 13c. This provides the percentage of land take compared to the initial built-up area.

14. Change of other land cover classes on the LECZ. As complementary to "Land take on the LECZ" the same procedure could be applied to eachland cover class as defined in Table 2. In that case the procedure described in 13 will be replicated by changing "artificial areas" with the other land cover classes.

15. Change of protected area within LECZ. This parameter will start to be computed on the second monitoring since the first monitoring focus only on the baseline(state at t0).

a) Filter the data by the grids belonging to the LECZ.

b) Calculate total area by counting the total number of cells. This is the area in ha.

c) Filter, within the LECZ, protected area for t0. Calculate area by counting the total number of cells. This is the area in ha.

d) Filter, within the LECZ, protected area for t1. Calculate area by counting the total number of cells. This is the area in ha.

e) Calculate 15d-15c and then divide by 15c. This provides the percentage of land take compared to the initial built-up area.

The above mentioned analysis can be complemented with the following ones that provide additional insight on the land cover indicator.

16. Additional analytical units

a) Setback zone (if defined by country). Given the relevance of this part of the coastal area, as referred on the ICZM protocol, the indicators on % of built-up and land take can be analysed for this specific zone.

b) Elevation breakdown within the coastal area. Distance to the coast and elevation are*elements that configure different habitat distribution and patterns. With available local knowledge 3 to 5 elevations classes could be considered to be analysed independently within the coastal area in order to better link the pressure of land take to specific habitats (5 – 10, 10 – 50, 50 – 100. 100 – 300, > 300).*

Ecological Objective	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	*Land cover change*

17. *Additional parameters*
    What has been lost by urbanization?
    a) *Filter the data by the grids belonging to the coastal zone.*
    b) *Calculate total area by counting the total number of cells. This is the area in km²*.
    c) *Develop a pivot table with land cover classes at t0, on rows, and land cover classes att1 on columns. Cells in this matrix will contain the area that has changed from certainland cover class at t0to a new class in t1.*
    d) *Select the column for "Built-up areas".*
    e) *Values on the rows indicate the different land cover classes at t0 that have been converted into built-up area.*
    f) *Values from e) can be divided by the corresponding area of the same class at t0. Thiswill provide the percentage of certain land cover class that has been converted into built-up.*

Expected assessments outputs

The outputs are detailed below:

- *Digital map with the land cover classes for the coastal area. Land cover classes should follow the classification provided in Table 2. If more detailed classification is available, thenit could be provided making the clear link with Table 2. The following specifications will ensure the interoperability of the maps provided by different institutions/countries:*
    - *Format: raster GeoTIFF (Geographic Tagged Image File Format) 1 ha*
    - *Metadata:*
        - *Title of the map*
        - *Geographic reference.*
            - *Bounding box.*
            - *Coordinate reference system*
        - *Temporal reference (year)*
        - *Responsible organisation*
- Spreadsheet with the calculated indicators as described in the methodology.
- Starting with the second monitoring, additional maps will be provided indicating areas of land take (new urbanization). The specifications for these maps are the same as indicatedabove.

Known gaps and uncertainties in the Mediterranean

The definition of the analytical units of the coastal zone could be revised in view of more detailed data on habitats distribution, or input from national experts. In any case it is important to take intoaccount the implications of the different delineations on the interpretation of the results.

The use of remote sensing and the selected resolution is the main constrain when analysing the outcomes

- *Not all changes are observed since there is minimum change detection. Therefore, the patterns observed indicate that changes are underestimated. In any case the proposed approach is still relevant since it provides an idea of the magnitude of the processes of urbanization.*
  Given the resolution and processing, linear elements are not well captured; therefore, linear elements perpendicular to the coast, for example, are not detected.
- *The information currently available does not allow identifying built-up on the territorialwaters.*

Since these limitations arise from the definition of the resolution, there is space for improvement if it is needed. However, there is always a trade-off between resolution and efforts required to obtain the information.

Ecological Objective	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved	
Indicator Title	*Land cover change*	
In addition, countries may obtain data from different sources (different resolution, different level of precision) which may make comparability of data difficult.		
Contacts and version Date		
Key contacts within UNEP for further information		
Version No	**Date**	**Author**
V.1	27/6/16	PAP/RAC
V.2	20/07/16	UAB
v.3	01/04/19	PAP/RAC
v.4	15/09/22	PAP/RAC
v.5	06/04/23	PAP/RAC

Appendix 7

Updated Reference List of Species and Habitats, Assessment Criteria and Scales, Threshold Values, Baseline Values for Biodiversity and Non-Indigenous Species

1. Introduction

1. The present document provides the elements related the monitoring and assessment of biodiversity and non-indigenous species (NIS) within the framework of the Integrated Monitoring and Assessment Programme (IMAP). It compiles the most recent versions of the Reference Lists of species and habitats, updated assessment criteria, spatial and temporal assessment scales, baseline and threshold values for several Common Indicators under Ecological Objectives 1 and 2 (Biodiversity and NIS). These elements have been developed through an extensive consultative process involving the Online Working Group on Biodiversity and NIS, and reviewed by the relevant CORMONs, SPA/BD Focal Points Meetings, and EcAp Coordination Group sessions.

2. The document also includes technical documents reviewed over the past years on benthic and pelagic habitats, marine mammals, marine turtles, seabirds, and NIS, reflecting the latest available scientific and technical consensus. While many of these elements have informed the 2023 Mediterranean Quality Status Report (MED QSR), they have not yet been formally endorsed.

3. This document consolidates them for formal consideration by the 12th Meeting of the EcAp Coordination Group and potential inclusion in the draft Decision on the revised EcAp Policy and Roadmap (2026–2035).

2. Reference List of Habitats

4. Contracting Parties are expected to monitor the distributional range and extent of key habitats (Common Indicator 1), as well as the condition of their typical species and communities (Common Indicator 2). This monitoring applies to both coastal and marine habitats, including pelagic habitats.

2.1 Marine Benthic Habitat Types

5. Marine Benthic habitat types in the Mediterranean region are listed in a *Reference List of Marine and Coastal Habitat Types in the Mediterranean* which was updated in 2019 (UNEP/MED WG.467/14, Decision IG.24/7 – Annex VI[1]) and published as the habitat typology for the Barcelona Convention (UNEP/MAP SPA/RAC, 2019; Montefalcone et al. 2021). This list supports the coherent use of a standardized typology in national inventories and monitoring programmes, enabling a consistent and adequate assessment of Ecological Objective 1 (EO1) and its related Common Indicators across the entire Mediterranean region.

6. The present Benthic Habitat Monitoring under IMAP focuses on three habitat types that have received particular attention in the implementation of IMAP's Ecological Objective 1 (EO1). The three habitat types are:

a. B1 Coralligenous
    i. MB1.55 Coralligenous (enclave of circalittoral)
    ii. MC1.51 Coralligenous cliffs (with 17 sub-types)
    iii. MC1.52a Coralligenous outcrops (with 9 sub-types)
    iv. MC1.52b Coralligenous outcrops covered by sediment (see MC1.52a for examples of facies)
    v. MC1.52c Deep banks (with 3 sub-types)
    vi. MC2.51 Coralligenous platforms (with 12 sub-types)
b. B2 Maërl
    i. MB3.511 Association with maërl or rhodoliths[2]
    ii. MB3.521 Association with maërl or rhodoliths
    iii. MC3.52 Coastal detritic bottoms with rhodoliths (with 9 sub-types)

[1] COP21, Naples, Italy, Decision IG.24/7, Annex VI "Updated Classification of Benthic Marine Habitat Types for the Mediterranean Region"
[2] MB3.511 and MB3.521 have the same habitat names but are listed under separate higher types (MB3.51 Infralittoral coarse sediment mixed by wave and MB3.52 Infralittoral coarse sediment under the influence of bottom currents).

c. B3 *Posidonia*
i. *Posidonia oceanica* meadow (MB2.54 with 7 sub-types[3])

7. Additional habitat types could be proposed by the Contracting party for EO1 monitoring and assessment.

2.2 Pelagic Habitat Types

8. Table 1 presents an updated reference list of pelagic habitat types in the Mediterranean Sea, as prepared by Multidisciplinary group of experts nominated by the Contracting Parties to define parameters allowing to use phytoplankton and zooplankton for relevant IMAP biodiversity indicators, the Conclusion and Recommendations of which were adopted by Decision IG.26/5 – Annex VII[4]). This list is intended to serve, where appropriate, as a basis for the identification and selection of reference pelagic habitats to be monitored and assessed at the national level under the IMAP.

9. The classification is based on the modified typology of pelagic habitats in the epipelagic layer (0–200 m), as proposed in the UNEP/RAC/SPA (2013) document, and was confirmed as relevant for use under IMAP by experts during the meetings of the CORMON Biodiversity and Fisheries held in June 2024 (UNEP/MED WG.592/06) and April 2025 (UNEP/MED WG.606/06). Contracting Parties are encouraged to adapt and further develop this list to reflect national specificities and priorities.

Table 1: Reference list of pelagic Habitat Types for the epipelagic layer (0-200m) (Annex VII of Decision IG.26/5)

	Pelagic Habitat Types	**Water mass**	**Comments***
A.1.	Reduced salinity water	coastal lagoons	WFD correspondence [5]
A.2.	Variable salinity water – high surface or subsurface CHL (>3 mg/m^3)	estuaries, river plumes	Transitional waters with WFD correspondence [6] (Values should be revised)
A.3.	Marine water: neritic - medium surface or subsurface CHL (0.5-3 mg/m^3)	upwellings, re-suspension in shallow waters and outskirts of river plumes, winter mixing areas	WFD water type II, type III
A.4.a	Marine water: oceanic - medium surface or subsurface CHL (0.5-3 mg/m^3)	Upwellings, and winter mixing areas	WFD water type III
A.4.b	Marine water: oceanic - low to medium surface CHL (~0.1-1.0 mg/m^3)	Hydrological features (fronts and gyres)	WFD water type III
A.5.a.	Marine water: oceanic - very low surface CHL (<0.1 mg/m^3) with deep CHL maximum	euphotic depth > mixed layer depth	WFD water type III
A.5.b.	Marine water: oceanic - very low surface CHL (<0.2 mg/m^3) without deep CHL maximum	euphotic depth < mixed layer depth	WFD water type III

* Each country should specify the range of CHLa, Salinity, depth and if annual/seasonal values are used. The typology of pelagic habitats represents a general framework that can be adapted and modified by CPs to integrate local ecosystems features and dynamics.

[3] Sub-types for a) *Posidonia* on artificial substrata and b) *Posidonia* association with *Zostera noltii* are not specifically defined in BC or EUNIS habitat classifications.
[4] COP24, Portoroz, Slovenia, Decision IG.26/5, Annex VII "Conclusions and recommendations of the Multidisciplinary group of experts nominated by the Contracting Parties to define parameters allowing to use phytoplankton and zooplankton for relevant IMAP biodiversity indicators and elaborate the List of Reference of Pelagic Habitat Types in the Mediterranean Sea".
[5] European Commission Decision 2018/229/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 Commission Decision 2013/480/EU (notified under document C (2018) 696) https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018D0229&from=PL
[6] WFD Annex 2 part 1.2.3. defines Transitional waters. see also Guidance document n.o 5 , Transitional and Coastal Waters, Typology, Reference Conditions and Classification Systems and Water Framework Directive Intercalibration Technical Report - Part 3: Coastal and Transitional Waters

3. Reference List of Species

3.1 Marine Sea Birds

10. Eleven indicator species were selected from Annex II of the Barcelona Convention (UNEP/MED IG.26/22, Decision IG.26/4), representing six functional groups, to be used for the assessment of the three relevant IMAP Common Indicators related to seabirds:

Coastal top predators:	*Pandion haliaetus*
Intertidal benthic-feeders:	*Charadrius alexandrinus*
Inshore benthic feeders:	*Gulosus aristotelis desmarestii*
Offshore surface-feeders:	*Ichthyaetus audouinii*
Inshore surface feeders:	*Croicocephalus genei, Thalasseus bengalensis*
emigrates,	*Thalasseus sandvicensis*
Offshore (surface or pelagic) feeders:	*Hydrobates pelagicus melitensis, Calonectris diomedea, Puffinus yelkouan, Puffinus mauretanicus*

3.2 Marine Mammals

Cetaceans:

11. All cetacean species occurring in the Mediterranean Sea are considered in the IMAP (UNEP/MED WG.514/Inf.1). Particular attention is given to the eight resident cetacean species, divided into three different functional groups:

a) Baleen whales: fin whale (*Balaenoptera physalus*).
b) Deep-diving cetaceans: sperm whale (*Physeter macrocephalus*), Cuvier's beaked whale (*Ziphius cavirostris*), long-finned pilot whale (*Globicephala melas*) and Risso's dolphin (*Grampus griseus*).
c) Other toothed species: short-beaked common dolphin (*Delphinus delphis*), striped dolphin (*Stenella coeruleoalba*), common bottlenose dolphin (*Tursiops truncatus*).

12. IMAP recommends monitoring and assessing common indicators for this selection of representative species for cetacean. However, four other rare species of cetaceans occur also in the Mediterranean Sea (UNEP/MED WG.514/Inf.1):

a) Harbour porpoise (*Phocoena phocoena*)
b) Rough-toothed dolphin (*Steno bredanensis*)
c) False killer whale (*Pseudorca crassidens*)
d) Killer whale (*Orcinus orca*).

Monk Seal:

13. Among the pinniped species worldwide, only the Mediterranean monk seal (*Monachus monachus*) is found in the Mediterranean Sea, where it maintains a small and vulnerable resident population that requires continuous monitoring and assessment.

3.3 Marine Turtles

14. Of the seven species of marine turtle that inhabit the world's oceans only two have established resident breeding populations in the Mediterranean and require assessment (UNEP/MED WG.514/Inf.12). These are the following:

a) Loggerhead turtle (*Caretta caretta*; IUCN (regionally) Least Concern).
b) Green turtle (*Chelonia mydas*; IUCN (globally) Endangered).

4. Assessment methodologies, assessment criteria and thresholds for biodiversity and NIS common indicators

15. This section compiles the assessment methodologies, assessment criteria, baseline and threshold values developed for the Common Indicators under IMAP Ecological Objectives 1 (Biodiversity) and 2 (Non-Indigenous Species – NIS). The content reflects the outputs of several years of collaborative work within the Online Working Group on Biodiversity and NIS, including contributions from thematic experts and focal points. It covers methodological proposals and assessment scales for benthic habitats (CI1, CI2), marine mammals, turtles, and seabirds (CI3, CI4, CI5), as well as for non-indigenous species (CI6), and includes detailed references to the supporting technical documents. These elements aim to inform future national and regional assessments, strengthen consistency in reporting, and enhance comparability across Contracting Parties under the Barcelona Convention framework.

4.1 Assessment Criteria and Thresholds for Biodiversity Common Indicators 1 and 2

16. This section provides a summary of the key components of the proposed assessment methodologies, criteria, and thresholds for the Common Indicators 1 and 2 (i.e., CI1 and CI2) on benthic habitats. Developed by SPA/RAC with the support of the Biodiversity Online Working Group, this proposal focuses on three priority habitat types: *Posidonia oceanica* meadows, coralligenous assemblages, and maërl beds. It builds on the results of the 2022–2023 feasibility study (UNEP/MED WG.547/11) and includes elements reviewed by the CORMON Meeting on Biodiversity and Fisheries (Athens, Greece, 7–8 April 2025; UNEP/MED WG.606/05) and the 17th Meeting of the SPA/BD Focal Points (Istanbul, Türkiye, 20–22 May 2025; UNEP/MED WG.608/16).

17. The most relevant methodological approaches, assessment criteria, and proposed threshold values, are summarized in Tables 2 and 3.

Table 2: Proposed parameters, metrics and indices for assessing CI1 and CI2 for the three habitat types at monitoring sites.

Habitat/CI	Minimum protocol	Optimal protocol
B1 Coralligenous **CI1**	Habitat extent (km^2) Habitat loss (m^2) Extent (km^2) and proportion (%) of habitat loss across all monitored sites	Extent of habitat loss at assessment area/national level
B1 Coralligenous **CI2**	For MACS (Enrichetti et al., 2019): Extent of hard bottom (% rock and biogenic) Species richness of conspicuous megabenthic sessile and sedentary species Structuring species: count, height (cm) and density (no. of colonies/individuals m^{-2}) % sediment cover % of colonies with epibiosis, necrosis and entangled in lost fishing gears for all structuring anthozoans Marine litter (density m^{-2})	For EBQI[7] and other indices (Di Camillo et al., 2023): Typical species composition Condition of key species/groups: • Filter- and suspension feeders (cover and diversity) • Detritivores abundance • Related fish assemblage biomass (distinguishing piscivores, carnivores of invertebrates, planktivores) Sensitivity level
B2 Maërl **CI1**	Analysis of existing knowledge (scientific and grey literature) on the presence of maërl/rhodolith beds Habitat extent (km^2)[8]	Extent of habitat loss at assessment area/national level

[7] FR: From Ruitton et al. 2014 updated by Astruch et al. (under review). See also: https://www.researchgate.net/publication/325607434_Guide_methodologique_pour_l%27evaluation_ecosystemique_des_habitats_marins.
[8] ES: To estimate this parameter for RMBs, firstly it will be necessary to have the maps of the benthic biocenoses throughout the entire continental shelf. Currently, these maps are only available for certain (few) areas.

	Habitat loss (m^2) Extent (km2) and proportion (%) of habitat loss across all monitored sites	
B2 Maërl **CI2**	Index to be defined. Rhodolith/maërl (% cover live and dead) Rhodolith/maërl density	Index to be defined. Species composition: abundance and diversity (filter-feeders, carnivores, detritivores, etc.) including echinoderms Particulate organic matter cover Detritic litter cover Rhodolith size and shape
B3 *Posidonia* **CI1**	Habitat extent (km^2) Habitat loss (m^2) Upper and lower depth limit of meadow (to nearest 0.1m) at monitored sites Extent (km2) and proportion (%) of habitat loss across all monitored sites Change in vertical distribution of habitat (+ or – m) at monitored sites	Extent of habitat loss at assessment area/national level
B3 *Posidonia* **CI2**	For PREI (Gobert et al., 2009): Leaf surface Leaf biomass Shoot density Lower limit depth and type Leaf epiphytes biomass For BiPO (Lopez y Royo et al., 2010) (same parameters as PREI but without sampling living material): Leaf surface Shoot density Lower limit depth and type For functional assessment: Sea urchin density	For EBQI (Personnic et al., 2014): Growth rate of vertical rhizomes Meadow cover Biomass density and species diversity in all compartments: • Filter- and suspension feeder density • Sea urchin *Paracentrotus lividus* density • Related fish assemblage biomass (distinguishing piscivores, carnivores of invertebrates, planktivores) • *Pinna* spp. density (not only *Pinna nobilis* now that *P. rudis* occurrence is increasing)
All sites	Parameters related to water quality (sea temperature, salinity, turbidity, transparency)	

Table 3: Overview of the main aspects of monitoring and assessment elements for CI1 and CI2 for the three habitat types Posidonia, coralligenous and maërl.

Element	CI1 & CI2
Habitat types	Define more clearly each of the habitat types, including specification of which EUNIS/BC subtypes are to be considered, and the most important pressures they face
Monitoring scale: number of sites	A minimum of five sites per habitat type per assessment area (28 subdivisions of Mediterranean region) Sites to be distributed across countries within each assessment area, and represent a gradient of conditions from impacted to non-impacted locations Assess state of habitats (extent and condition) at monitoring sites as a proxy for their state across the wider assessment areas and region (to make monitoring and assessment process feasible for all Contracting Parties)
Monitoring methods: parameters	Refer to Table 2 for minimum and optimal set of parameters per habitat type.
State/impact monitoring in context of pressures	Sites selected for detailed monitoring should include a range of pressures or intensities of pressures, as well as sites which are 'unimpacted'. Pressures (and related activities) should be reported at monitoring sites and across each country (linked to EO6), assigning data to a standardised grid system.
Assessment scale	Use same set of assessment areas (28 subdivisions of the 4 Mediterranean subregions) as proposed for EO6.
Assessment methods	Use several indicators to represent differing aspects of habitat distribution and extent (CI1) and structure and function (CI2), as given in Table 2. The indicators need testing with data from multiple CPs to help define suitable thresholds and ensure comparability of results across the region.
Data standards	Simplify data standards to facilitate data submission and aggregation for analyses.
Baselines	Use unimpacted sites to establish the current extent and state of each habitat type in reference state (under prevailing physiographic, geographic, climatic and environmental conditions).
Quality threshold	Re-evaluate threshold once sufficient data are available to set fully meaningful threshold for the assessment area/subregion and habitat type. Ensure equivalent level of quality across assessment areas, habitats, indicators and pressures.
Extent thresholds	Set thresholds for the maximum extent of habitat loss (for CI1) and habitat which is adversely affected (for CI2) that is permitted per habitat in each assessment area.
Progress with monitoring and assessment processes	Contracting Parties should update their monitoring programmes, if necessary, based on general agreements for monitoring and assessment elements. SPA/RAC should evaluate progress in implementation of the monitoring programmes, say at a mid-point in the 6-year data collection phase. This evaluation should include the state of data submissions to the IMAP Info System and undertaking a trial region-wide assessment. Outcomes should guide further implementation of the programmes in the lead up to the next MedQSR assessment.

4.2 Assessment Criteria and Thresholds for Biodiversity Common Indicators 3, 4 and 5 related to Marine Mammals

18. This section summarizes the key elements proposed for the monitoring and assessment of IMAP Common Indicators 3, 4 and 5 (i.e., CI3, CI4, and CI5) related to marine mammals. to be note that the proposed assessment criteria takes into consideration the interlinkages with Common Indicator 12 (CI12: bycatch of vulnerable species).

19. The proposed approach, developed in collaboration with the Biodiversity Online Working Group on marine mammals and reviewed by CORMON, ACCOBAMS experts, and SPA/BD Focal Points, follows a stepwise process: refining monitoring and assessment scales, establishing criteria, and proposing threshold and baseline values. These elements were tested during the preparation of the 2023 Mediterranean Quality Status Report (MED QSR) and will continue to be improved within the framework of the third MED QSR cycle.

20. This approach and its technical components were reviewed during the following key meetings:

- 8th Meeting of the Ecosystem Approach Coordination Group (videoconference, 9 September 2021; UNEP/MED WG.514/Inf.11)
- Fifteenth Meeting of the SPA/BD Focal Points (videoconference, 23–25 June 2021; UNEP/MED WG.502/16.Appendix B)
- Meeting of the Ecosystem Approach Correspondence Group on Monitoring (CORMON), Biodiversity and Fisheries (videoconference, 10–11 June 2021; UNEP/MED WG.500/4)

21. The refined scales of monitoring, suitable scales of assessment and assessment criteria (i.e., Threshold and Baseline Values) are summarized in Table 4.

Table 4: Biodiversity common indicators 3, 4 and 5 related to Marine Mammals (Ecological Objectives, GES Definitions and Targets, Monitoring and Assessment Scales, Assessment Criteria, Threshold and Baseline Values) (Extracted from UNEP/MED WG.514/Inf.11[9])

Common Indicator 3 (CI3)[10]					
Refining scales of monitoring, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.		**Developing scales of assessment (if different from those of monitoring) and assessment criteria**		**Develop threshold and baseline values**	
Species/functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposed changes***	***Existing context***	***Proposals***
Fin whale / Mysticetes	**Primary monitoring** • *Geographic scale*: Regional. • *Method*: standard & synchronised between all countries (i.e. ASI-like). • *Frequency*: at least once per reporting period. **Secondary monitoring** • *Geographic scale*: Sub-Regional / National. ○ **High Priority sub-regions** (HP): in WM and I&CM key habitats for this species (i.e. feeding, corridor). ○ **Low priority sub-regions** (LP) in A and A&LS. • **Method**: ○ in **HP**: systematic regular monitoring (including photo-id). ○ in **LP** complement systematic monitoring with other adequate and standard method (UNEP MAP 2019). • **Frequency**: ○ in **HP** sub-regions the minimum requirement is: at least three times (better annually in selected places); ○ in **LP** at least one time over the reporting period.	New proposal in UNEP/MED WG.450/3: • Regional: large cetaceans	• Primary assessment/MRU: Regional. • Frequency: once every reporting period.	None	**Reference values distributional range**: • *Mediterranean cetaceans* (**all species**): map to be created based on Mannocci et al. 2018, Canadas et al. 2018 (*Ziphius*) • *Adriatic cetaceans*: Fortuna et al. 2018 (*Tusiops, Stenella*) • *Monk seals*: map to be created based all existing data. **Thresholds for distributional range**: • The extent of the distribution of each species remains stable or expanding compared to a **reference map** (see above). In particular, the Extent of occurrence (EOO) shows: 1) no decline (in all sub-regions where the species was regularly found since last assessment, 2) no decline of number of locations or local putative populations for the species within its distributional range. Given the difficulty to assess the distribution of cetacean species at a finer scale, both reference values and thresholds for this CI should be revised at each assessment cycle.
Sperm whale / Odontocete (deep feeder)	**Primary monitoring** • **Geographic scale**: Regional. • **Method**: As in previous cell. • **Frequency**: As in previous cell. **Secondary monitoring** • **Geographic scale**: Sub-Regional / National. ○ **High Priority** (HP) in WM, I&CM and A&LS key habitats for this species (i.e. breeding, corridor). ○ **Low priority** (LP) in A • **Method**: As in "Fin whale" cell. • **Frequency**: As in "Fin whale" cell.			None	
Cuvier's beaked whale (deep feeder)	**Primary monitoring** • **Geographic scale**: Regional. • **Method**: As in "Fin whale" cell. • **Frequency**: As in "Fin whale" cell. **Secondary monitoring** **Geographic scale**: Sub-Regional / National. ○ **High Priority** (HP) in WM, I&CM and A&LS key habitats for this species (i.e. feeding). ○ **Low priority** (LP) in A • **Method**: As in "Fin whale" cell. • **Frequency**: As in "Fin whale" cell.			None	

Key: MS=Monitoring Scale, AS=Assessment Scale, MRU=Marine Reporting Units

[9] 8th Meeting of the Ecosystem Approach Coordination Group (EcAp CG), Videoconference, 9 September 2021.
[10] https://www.medqsr.org/common-indicator-3-species-distributional-range-marine-mammals

Common Indicator 3 (CI3)					
Refining scales of <u>monitoring</u>, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.		**Developing scales of assessment and assessment criteria**		**Develop threshold and baseline values**	
Species/ functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposed changes***	***Existing context***	***Proposals***
Long finned pilot whale (epipelagic feeder)	**<u>Primary monitoring</u>** • **Geographic scale**: Regional. • **Method**: standard & synchronised between all countries (i.e. ASI-like). • **Frequency**: at least once per reporting period. **<u>Secondary monitoring</u>** • **Geographic scale**: Sub-Regional / National. ○ **High Priority sub-regions** (HP) in WM key habitats for this species (i.e. feeding, corridor). ○ **Low priority** (LP) in I&CM. • **Method**: ○ in **HP**: systematic regular monitoring; ○ in **LP** complement systematic monitoring with other adequate and standard method (UNEP MAP 2019). • **Frequency**: ○ in **HP** sub-regions the minimum requirement is biannual; ○ in **LP** at least one time over the reporting period.	New proposal in UNEP/MED WG.450/3: • Sub-regional: small cetaceans	• **Primary assessment/MRU**: Regional. • **Frequency: once every reporting period.**	None	*See previous page.*
Risso's dolphin (epipelagic feeder)	**<u>Primary monitoring</u>** • **Geographic scale**: Regional. • **Method**: As in previous cell. • **Frequency**: As in previous cell. **<u>Secondary monitoring</u>** • **Geographic scale**: Sub-Regional / National. ○ **High Priority sub-regions** (HP) in WM & A key habitats for this species (i.e. feeding, corridor). ○ **Low priority** (LP) in I&CM and A&LS. • **Method**: As in “Fin whale” cell. • **Frequency**: As in “Fin whale” cell.			None	
Bottlenose dolphin (epipelagic feeder)	**<u>Primary monitoring</u>** • **Geographic scale**: Regional. • **Method**: As in previous cell. • **Frequency**: As in previous cell. **<u>Secondary monitoring</u>** • **Geographic scale**: Sub-Regional / National. ○ **High Priority sub-regions** (HP) in key habitats for this species in all sub- regions (i.e. feeding, corridor). ○ **Low priority** (LP) in offshore areas. • **Method**: As in “Fin whale” cell. • **Frequency**: As in “Fin whale” cell.			None	
Common dolphin (epipelagic feeder)	**<u>Primary monitoring</u>** • **Geographic scale**: Regional. • **Method**: As in previous cell. • **Frequency**: As in previous cell. **<u>Secondary monitoring</u>** • **Geographic scale**: Sub-Regional / National. ○ **High Priority sub-regions** (HP) in WM, A&LS key habitats for this species (i.e. feeding, corridor). ○ **Low priority** (LP) in A, I&CM. • **Method**: As in “Fin whale” cell. • **Frequency**: As in “Fin whale” cell.			None	
Striped dolphin (epipelagic feeder)	**<u>Primary monitoring</u>** • **Geographic scale**: Regional. • **Method**: As in “Fin whale” cell (except for photo-id). • **Frequency**: As in “Fin whale” cell.			None	

Common Indicator 3 (CI3)					
Refining scales of <u>monitoring</u>, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.		**Developing scales of assessment and assessment criteria**		**Develop threshold and baseline values**	
Species/ functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposed changes***	***Existing context***	***Proposals***

Monk Seal	**<u>Primary monitoring</u>**
	• **Geographic scale**: Sub-regional
	  ○ In Group A countries:
	  ○ Specifically, monitor populations in sites consistent with the Regional Strategy for the conservation of Monk seal in the Mediterranean (RSMS).
	  ○ In Group B and C countries: area with suitable habitat and/ historical presence.
	• **Method**:
	  ○ In Group A countries:
	    ▪ Registry on opportunistic
	    ▪ sightings / citizen science
	    Photo traps in selected caves
	  ○ In Group B & C countries:
	    ▪ Registry on opportunistic sightings
	    ▪ (minimum requirement)
	    Photo traps in selected caves of selected locations identified by the revised RSMS.
	• **Frequency**: Annual (minimum requirement) or all known locations in each Group A country covered at least three times (biannually) per reporting period.
		None	• **Primary assessment/MRU**: Regional.
			
			• **Frequency**: once every reporting period.
				None	**Reference values distributional range**:
					• *<u>Monk seals</u>*: map to be created based all existing data.

Key: MS=Monitoring Scale, AS=Assessment Scale, MRU=Marine Reporting Units

Common Indicator 4 (CI4)					
Refining scales of <u>monitoring</u>, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.		**Developing scales of assessment and assessment criteria**		**Develop threshold and baseline values**	
Species/functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposals***	***Existing context***	***Proposals***
Fin whale	**<u>Primary monitoring</u>** • *Geographic scale*: Regional. • *Method*: standard & synchronised between all countries (i.e. ASI-like). • *Frequency*: at least once per reporting period. **<u>Secondary monitoring</u>** • *Geographic scale*: Sub-Regional / National. ○ *High Priority sub-regions* (HP): in WM and I&. ○ *Low priority* (LP):in A and A&LS. • **Method**: ○ in HP: systematic regular monitoring (including photo-id); ○ in LP complement systematic monitoring with other adequate and standard method (UNEP MAP 2019). • **Frequency**: ○ in HP sub-regions the minimum requirement is biennial. ○ in LP at least one time over the reporting period.	***IMAP Monitoring Protocols 2019***	• **Assessment / MRU**: Regional. • **Frequency: once every reporting period.**	None	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels. • When listed as LC, no decrease of ≥20% over 3 generations (1.5% within a 6-year reporting period). • Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details).
Sperm whale	**<u>Primary monitoring</u>**: As in "Fin whale" cell. **<u>Secondary monitoring</u>**: • *Geographic scale*: Sub-Regional / National. ○ HP: in WM, I&CM and A&LS. ○ LP: in A. • *Method*: As in "Fin whale" cell. • *Frequency*: As in "Fin whale" cell.	None.		None.	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels. • When listed as LC, no decrease of ≥20% over 3 generations (1.3% within a 6-year reporting period). • Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details).
Cuvier's beaked whale	**<u>Primary monitoring</u>**: As in "Fin whale" cell. **<u>Secondary monitoring</u>** • *Geographic scale*: Sub-Regional / National. ○ HP in WM, I&CM and A&. ○ LP in A. • *Method*: As in "Fin whale" cell. • *Frequency*: As in "Fin whale" cell.	None.		None.	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels. • When listed as LC, no decrease of ≥ 1.5% within a 6-year reporting period. • Regional reference value: Canadas *et al.* 2018 & ASI 2018 DS design-based estimate (see Box 4 for details).
Long finned pilot whale	**<u>Primary monitoring</u>**: As in "Fin whale" cell. **<u>Secondary monitoring</u>** • *Geographic scale*: Sub-Regional / National. ○ **High Priority sub-regions** (HP) in WM. ○ **Low priority** (LP) in I&CM. • **Method**: As in "Fin whale" cell. ○ **Frequency**: As in "Fin whale" cell.	None.		None.	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels. • When listed as LC, no decrease of ≥20% over 3 generations (1.7% within a reporting period). • Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details).

Risso's dolphin	**<u>Primary monitoring</u>**: As in "Fin whale" cell. **<u>Secondary monitoring</u>** • **Geographic scale**: Sub-Regional / National. ○ **High Priority sub-regions** (HP) in WM & A. ○ **Low priority** (LP) in I&CM and A&LS. • **Method**: As in "Fin whale" cell. • **Frequency**: As in "Fin whale" cell.	None.		None.	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels. • When listed as LC, no decrease of ≥20% over 3 generations (2.0% within a reporting period). • Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details).

Key: MS=Monitoring Scale, AS=Assessment Scale, MRU=Marine Reporting Units

Common Indicator 4 (CI4)					
STEP 1 **Refining scales of <u>monitoring</u>, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.**		**STEP 2** **Developing scales of assessment and assessment criteria**		**STEP 3** **Develop threshold and baseline values**	
Species/functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposals***	***Existing context***	***Proposals***
Bottlenose dolphin	**<u>Primary monitoring</u>**: As in "Fin whale" cell. **<u>Secondary monitoring</u>** • **Geographic scale**: Sub-Regional / National. ○ **High Priority sub-regions** (HP). ○ **Low priority** (LP) in offshore areas. • **Method**: As in "Fin whale" cell. • **Frequency**: As in "Fin whale" cell.	None.		None.	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels. • No decrease of ≥20% over 3 generations (1.9% within a reporting period). • Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details). ○ Adriatic: Reference value (2010: Fortuna et al. 2018)
Common dolphin	**<u>Primary monitoring</u>**: As in "Fin whale" cell. **<u>Secondary monitoring</u>** • **Geographic scale**: Sub-Regional / National. ○ **High Priority sub-regions** (HP) in WM, A&LS key habitats for this species (i.e. feeding, corridor). ○ **Low priority** (LP) in A, I&CM. • **Method**: As in "Fin whale" cell. • **Frequency**: As in "Fin whale" cell.	None.		None.	• Check IUCN Mediterranean Red Listing and if EN, CR, VU then maintain total abundance at or above reference levels. • When listed as LC, no decrease of ≥20% over 3 generations (2.7% within a reporting period). • Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details).
Striped dolphin	**<u>Primary monitoring</u>**: As in "Fin whale" cell.	None.		None.	• Check IUCN status and if EN, CR, VU then > only. • Maintain total abundance at or above reference levels. • When listed as LC, no decrease of ≥20% over 3 generations (1.8% within a reporting period). • Regional reference value: ASI 2018 DS design-based estimate (see Box 4 for details).
Monk Seal	**<u>Primary monitoring (pending definition of a single standardised method to avoid double counting and allow inter-regional comparison)</u>** • **Geographic scale**: Sub-regional • **Method**: ○ Group A countries: ▪ Individuals counts based on cave monitoring (minimum requirement) and/or mark-recapture based on photo-identified seals data in sites consistent with the revised Monk seal strategy. ○ Group B & C countries: ▪ Photo-identification of individuals based on images obtained from non-invasive monitoring of resting caves. Caves in sites that require monitoring should be decided based on evidence of recurrent sightings recorded through the results of the opportunistic sighting registry ○ **Frequency**: Annual.	None.	• **Assessment/ MRU**: Regional	None.	• Increase on total population of 1% over six-year reporting period AND increase in number of pups compared to the last assessment. • Provisional reference value: to be estimated.

Key: MS=Monitoring Scale, AS=Assessment Scale, MRU=Marine Reporting Units

Common Indicator 5 (CI5)					
Refining scales of <u>monitoring</u>, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.		**Developing scales of assessment and assessment criteria**		**Develop threshold and baseline values**	
Species/ functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposals***	***Existing context***	***Proposals***
Cetaceans (*Stenella*, *Tursiops* and *Balaenoptera* as proxy for functional groups)	**<u>Primary monitoring</u>** • **Geographic scale**: Sub-regional / National. • **Species**: focus on *Stenella*, *Tursiops* and *Balaenoptera*. **Parameters**: ○ adult survival probability, juvenile survival probability; fecundity/breeding productivity/rate; age class distribution; sex ratio; population growth rate. • **Method**: ○ **Stranding network** collecting standard measures and biological material (e.g., teeth and reproductive organs) ○ **Photo-ID network** collecting standard pictures (list of parameters including calf) • **Frequency**: continuous for strandings, regularly and frequent for photo-ID. **<u>Secondary monitoring</u>** • **Geographic scale**: Sub-Regional. • **Method**: one dedicated concerted and cooperative campaign collecting biopsies (for sex ratio, and hormones rates). • **Frequency**: at least once per reporting period.		• **Assessment/ MRU**: Sub-regional & all “local populations” (long-term studies). • **Frequency**: once per reporting period.		It is not possible to develop reference and threshold values at this point.
Monk seal	**<u>Primary monitoring</u>** • **Geographic scale**: Sub-regional in countries Group A. • **Method**: Pup counts in critical/selected breeding caves (minimum requirement). • **Frequency**: annual.		• **Assessment/MRU**: Sub-regional & all “colonies”. • **Frequency**: once per reporting period.		**Reference values demography**: • *<u>Total annual national pup counts</u>*: to be estimated. • *<u>Annual birth rate</u>*: define index areas and produce estimates. **Threshold values**: • Increase from last assessment.

Key: MS=Monitoring Scale, AS=Assessment Scale, MRU=Marine Reporting Units

CI12: Bycatch of vulnerable and non-target species (EO1 and EO3)					
Refining scales of <u>monitoring</u>, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.		**Developing scales of assessment and assessment criteria**		**Develop threshold and baseline values**	
Species/ functional group	***Proposed changes*** Key: WM=Western Mediterranean; I&CM=Ionian and Central Mediterranean; A=Adriatic; A&LS=Aegean and Levantine seas.	***Existing context***	***Proposals***	***Existing context***	***Proposals***
Marine mammals	• In each GFCM GSA, at least one year of cetacean bycatch rate monitoring per each high priority fishing métiers (to be defined), within each reporting cycle. • GFCM provides data on fishing effort during reference year for priority fishing métiers, for each GSA. • **Annually**: bycatch (onboard observations, questionnaires and strandings) and systemic pollution (strandings) • CPs monitor their fleets (**at least one métier per sub-region per year, rotating**). • National stranding network collect data on fishery-induced mortality and level of pollutants in marine mammal tissues. They provide biennial reports on these matters. • Each CP: national monitoring schemes to provide bycatch rates and annual fishing effort.		• **Assessment /MRU**: Regional & Sub-regional (or aggregated GFCM GSAs). • **Frequency**: annual or biennial.		• **Regional**: BRA on each species for the potentially most dangerous fishing gears. ○ Threshold of the total estimated bycatch per all fishing gears: **1% of the total population**. This triggers in-depth monitoring programmes. • **Sub-regional**: ***thresholds*** calculated with CLA or RLA on each species, based on actual observations on bycatch rates, total fishing effort, biological parameters and conservation objectives (CLA = 72% K; RLA = 80% K).

Key: MS=Monitoring Scale, AS=Assessment Scale, MRU=Marine Reporting Units

4.3 Assessment Criteria, Thresholds and Baseline Values for the IMAP Common Indicators 3, 4 and 5 related to Marine Turtles

22. This section summarizes the key elements proposed for the monitoring and assessment of IMAP CI3, CI4, and CI5 related to marine turtles.

23. The proposed methodology, elaborated with the support of the Biodiversity Online Working Group on marine turtles, was reviewed and discussed during three key meetings:

- The Meeting of the Ecosystem Approach Correspondence Group on Monitoring (CORMON) Biodiversity and Fisheries (Videoconference, 10–11 June 2021; UNEP/MED WG.500/5);
- The 15th Meeting of SPA/BD Focal Points (Videoconference, 23–25 June 2021; UNEP/MED WG.502/16 Rev.1.Appendix C. Rev.1); and
- The 8th Meeting of the Ecosystem Approach Coordination Group (EcAp CG) (Videoconference, 9 September 2021; UNEP/MED WG.514/Inf.12).

24. The refined scales of monitoring, suitable scales of assessment and assessment criteria (i.e., Threshold and Baseline Values) are summarized in Table 5.

Table 5. Summary Tables of the methodological approach and results of the analysis on monitoring and assessment scales, assessment criteria and thresholds and baseline values for the Common Indicators 3,4 and 5 related to sea turtles

Common Indicator 3 (CI3)							
STEP 1 **Refining scales of monitoring, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.**		**STEP 2** **Developing scales of assessment**		**STEP 3** **Developing assessment criteria**		**STEP 4** **Develop threshold and baseline values**	
Existing context	**Proposed changes**	**Existing context**	**Proposals**	**Existing context**	**Proposals**	**Existing context**	**Proposals**

Species distribution ranges[11] can be gauged at local (i.e., within a small area like a national park) or regional (i.e., across the entire Mediterranean basin) scales using a variety of approaches. Long- term monitoring of these areas provides information on the temporal evolution in species distributions.	Revise mapping requirements to two maps; one for nesting areas and one for marine areas.
	
	Nesting areas monitoring
	• Geographic scale:
	  ○ (sub-)National. Up to 7 established sites or 75% of national nesting activity (index areas)
	• Method:
	  ○ standard nesting beach surveys.
	• Frequency:
	  ○ Minimum = June/July annually for index areas.
	  ○ six-yearly national scale.
	
	Nearshore monitoring
	• Geographic scale:
	  ○ (sub-)National. Up to 4 sites.
	• Method:
	  ○ systematic regular monitoring index areas.
	  ○ bycatch/stranding data.
	• Frequency:
	  ○ biannual monitoring index areas.
	  ○ year-round bycatch/stranding recording.
	  ○ six-yearly national scale.
	
	Offshore monitoring
	• Geographic scale:
	  ○ (sub-)National/regional.
	• Method:
	  ○ Aerial surveys
	  ○ Boat surveys
	  ○ Bycatch recording.
	  ○ Opportunistic boat surveying.
	• Frequency:
	  ○ Yearly for aerial and boat surveys
	  ○ Year-round for bycatch records
	  ○ *Ad hoc* boat surveying.
	  ○ six-yearly national scale.
		The European (ETRS) 10x10km grid is used for mapping the distribution and range…, Three different maps (grids) are produced yearly for each species accounting for breeding sites, wintering sites and feeding/developmental sites.
		
		Number of 10x10 km cells (presence/absence) occupied for breeding or wintering or feeding/developmental areas along the Mediterranean (or subregional) coast and in all pelagic marine areas.
			Nesting areas
			National and Subdivisional level GES assessments based on maintenance of distribution of all nesting sites.
			
			Marine areas
			Subregional GES assessments.
				Turtles continue to nest in all known nesting sites.
				
				Turtle distribution is not significantly affected by human activities.
					Nesting areas
					Turtles remain present in all parts of annually monitored nesting sites and at all established sites during periodic surveys.
					
					Marine areas
					Turtles remain present in all annually monitored, CP defined, hotspot areas and no evidence of definitive absences in any other area withing the RMU distribution.
						None	Nesting areas
							Baselines centred on 1992 to be used for established nesting sites. More recent data to be modelled to 1992 era levels for these sites. New and emerging sites to use maximum existing 6- year average as baseline.
							
							Marine areas
							All areas assumed to have turtle presence (in line with updated IUCN-MTSG RMU boundaries) unless proven otherwise.

[11] https://www.medqsr.org/common-indicator-3-species-distributional-range-marine-turtles

Common Indicator 4 (CI4)							
STEP 1 **Refining scales of monitoring, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.**		**STEP 2** **Developing scales of assessment**		**STEP 3** **Developing assessment criteria**		**STEP 4** **Develop threshold and baseline values**	
Existing context	**Proposed changes**	**Existing context**	**Proposals**	**Existing context**	**Proposals**	**Existing context**	**Proposals**
For counts carried out on an annual basis, a number of sites should be selected that represent a sufficiently large proportion of the subregional or national population, with criteria being delineated by expert groups. of selected species[12]	Nesting areas monitoring • Geographic scale: ○ (sub-)National. Up to 7 sites or 75% of national nesting activity (index areas) • Method: ○ standard nest count surveys. • Frequency: ○ Minimum = June/July annually for index areas. ○ six-yearly national scale. Nearshore monitoring • Geographic scale: ○ (sub-)National. Up to 4 sites. • Method: ○ systematic regular monitoring index areas. ○ bycatch/stranding data. • Frequency: ○ biannual monitoring index areas. ○ year-round bycatch/stranding recording.	For counts carried out on an annual basis, a number of sites should be selected that represent a sufficiently large proportion of the subregional or national population, with criteria being delineated by expert groups. The "Demography Working Group" suggests that comprehensive surveys should be carried out every 5 years, with the aim of covering all breeding, foraging, wintering and developmental sites. However, here, it is recommended that the whole coastal and marine area is covered on a national or subregional scale to take into account changes in population	Nesting areas National and Subdivisional level GES assessments based on maintenance of nesting abundance at all sites. Marine areas Subregional GES assessments based on relevant population segments present in each area.	Nesting areas The average breeding population size during at least a decade is suggested as the base level (based on International Union for Conservation of Nature Red List minimal criteria for sea turtles) Marine areas for non-breeding animals at wintering / foraging / developmental sites, number of individuals (n) with appropriate modelling to extrapolate population numbers	Nesting areas Rolling average of previous six years' data to count in the annual assessment. To coincide with the six-yearly regionwide GES assessments. Marine areas Rolling average of previous six years' data to count in the annual assessment. To coincide with the six-yearly regionwide GES assessments. Observations on numbers of turtles in different life-stages and sex ratios to be considered	None.	Nesting areas Baselines centred on 1992 to be used for established nesting sites. More recent data to be modelled to 1992 era levels for these sites. New and emerging sites to use maximum existing 6-year average as baseline. Marine areas GES baseline taken as annual abundance derived from existing modelled

[12] https://www.medqsr.org/common-indicator-4-population-abundance-selected-species-marine-reptiles
Cardona L, et al. (2015) Demography of marine turtles nesting in the Mediterranean Sea: a gap analysis and research priorities. Demography Working Group of the 5th Mediterranean Conference on Sea Turtles. 37pp. Bern Convention, T-PVS/Inf (2015) 1
4 Sparks LM & DiMatteo AD (2020) Loggerhead sea turtle density in the Mediterranean Sea. NUWC-NPT Tech Rep 12360. 77pp.

Common Indicator 5 (CI5)							
STEP 1 **Refining <u>scales of monitoring</u>, by revising the existing IMAP proposals and identifying adequate scales for the most relevant species in the Mediterranean context.**		**STEP 2** **Developing <u>scales of assessment</u>**		**STEP 3** **Developing <u>assessment criteria</u>**		**STEP 4** **Develop <u>threshold and baseline values</u>**	
Existing context	**Proposed changes**	**Existing context**	**Proposals**	**Existing context**	**Proposals**	**Existing context**	**Proposals**
A number of sites should be selected that represent a ***sufficiently large proportion of the subregional or national population for demographic data to be collected (reflecting the breeding, wintering, foraging and developmental populations that are representative of the region)***[13]. If possible, populations should be selected where animals have been tracked with a sufficient number of units (i.e., >50 individuals), from which the connectivity among these different habitat types can be established.	<u>Nesting areas monitoring</u> • Geographic scale: ○ (sub-)National. Up to 7 established sites or 75% of national nesting levels • Methods: ○ Standard: hatchling emergence success (HES) and nest temperature data. ○ Additional: Sex ratio adults • Frequency: ○ Annually, Minimum: August/September for index area HES and May-September for temperature data. April-May for adult sex ratios. ○ six-yearly national scale. <u>Nearshore monitoring</u> • Geographic scale: ○ (sub-)National. Up to 4 index hotspot sites. • Method: ○ systematic regular monitoring index areas. ○ bycatch/stranding data. • Frequency: ○ biannual monitoring index areas. ○ year-round bycatch/stranding recording. ○ six-yearly national scale. <u>Offshore monitoring</u> • Geographic scale: ○ (sub-)National. • Method: ○ Bycatch recording. ○ Opportunistic boat surveying. • Frequency: ○ Year-round bycatch records ○ *Ad hoc* boat surveying. • ○ six-yearly national scale.	The selected breeding sites should aim to be genetically diverse, so as this diversity can be detected at foraging/ wintering/ developmental grounds where different populations diverge. This will facilitate the selection of marine areas for protection that support the highest genetic diversity (i.e., the greatest accumulation of different breeding populations), as well as those that support single breeding populations, which may be of equal importance. Opportunistic data should be collected from all possible sources, wherever possible, and compiled into a single database, which might be used to provide an overview of the entire area. Knowledge about the sex, health and genetic structure of the different populations/subpopulations will be obtained, by Understanding recruitment and mortality within different parts of a population and across populations. This information is important to understand whether there are sex-specific mortality risks at different age/size classes, which is important towards aiding population recovery. Also, knowledge on the physical health and genetic health of populations will be obtained, which will indicate the capacity for resilience to human activities, including climate change.	<u>Nesting areas</u> National and Subdivisional level GES assessments. <u>Marine areas</u> Subregional GES assessments.	publication). Most studies that do exist are focused on the breeding areas; thus, greater focus is required at foraging, wintering and developmental areas, with in-water limitations needing to be accounted for in analyses. Therefore, set analyses need to be established that are applicable within and/or across the different habitat types to allow comparison at the Mediterranean level.	<u>Nesting areas</u> Maintenance of suitable hatchling sex ratios and high hatchling emergence success. <u>Marine areas</u> Quantification of bycatch and calculation of bycatch mortality rates. Observations on numbers of turtles in different life-stages and sex ratios to be considered for indications of perturbations in population structure.	No threshold and baseline values have been consistently defined and applied to date.	<u>Nesting Areas</u> 'Good' HES values can be taken from published literature and taken as thresholds with a buffer zone for improved conservation measures. Nest temperature records to be monitored with estimations of over 95% female production as an upper threshold. <u>Marine areas</u> Human-induced mortality asa component of longevity and survivorship is the one factor that can be measured and affected by conservation actions and hence can be considered as an actionable indicator for GES. Numbers of deaths should be used as the indicator with a stable or declining trend in numbers indicating GES

[13] https://www.medqsr.org/common-indicator-5-population-demographic-characteristics-marine-reptiles

4.4 Assessment Criteria, Thresholds and Baseline Values for the IMAP Common Indicators 3, 4 and 5 related to Sea Birds

25. This section presents the key elements developed for the monitoring and assessment of IMAP CI3, CI4 and CI5 related to seabirds in the Mediterranean. The proposed assessment elements, were prepared in coordination with the informal Online Working Group (OWG) on seabirds, and discussed during the Meeting of the Ecosystem Approach Correspondence Group on Monitoring (CORMON) Biodiversity and Fisheries (Videoconference, 28–29 March 2022; UNEP/MED WG.520/4). They were also presented during the 9th Meeting of the Ecosystem Approach Coordination Group (EcAp CG) (Videoconference, 5 July 2022) as information document (UNEP/MED WG.521/Inf.7).

26. The refined scales of monitoring, suitable scales of assessment and assessment criteria (i.e., Threshold and Baseline Values) are summarized in Table 6.

Table 6. Summary Tables of the methodological approach and results of the analysis on monitoring and assessment scales, assessment criteria and thresholds and baseline values for the Common Indicators 3,4 and 5 related to seabirds

	Species	Common Indicator	Assessment Criteria	Baseline	Threshold	Scales of Assessment	Scales of Monitoring
1	Osprey *Pandion haliaetus*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Reference-based baseline: pristine conditions baseline with widest known range in the last 100 years. Modern baseline: If no reliable historic data are available, modern baseline with widest known range in last 20 years	Not more than 10% deviation from baseline	Spatial: Regional and sub-regional Temporal: Annual, with reporting every six years	Spatial: National, surveys covering at least all known breeding areas Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to IMAP reporting cycles
		CI 4: Population abundance	Annual relative breeding bird abundance (annual abundance / baseline abundance)	Reference-based (modern) baseline: Abundance at the start of the implementation of BD (1981) Alternatively: highest breeding abundance estimate in the last 20 years Additionally: Highest abundance of entering population in the last 20 years	Deviation from baseline: annual relative breeding and wintering abundance > 0.7	Spatial: Regional and sub-regional (all sub-regions, but with main focus on Western Mediterranean Sea) Temporal: Aiming at annual assessment with reporting every six years	Spatial: National or sub-national (aiming at 100% of known nesting sites) Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate: Reproductive success of monitored nests Survival rates of adult and young from capture-mark-resighting (colour-ringing of nestlings)	Model-based baseline: growth rates in the last assessment cycle Population	Deviation from growth rate of 1.0 or higher baseline: Population	Spatial: Regional, sub- Temporal: Annual breeding success and survival rates with reporting every 6 years regional and national	Spatial: National or sub-national, aiming at 100% assessment (all known nests) of reproductive success Representative subsample of accessible nests for colour-ringing of nestlings Temporal: Annual for breeding success and survival via reading of colour rings

2	Kentish Plover *Charadrius alexandrinus*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding and wintering populations % Shift in occupancy for breeding and wintering population	Reference-based baseline for breeding and wintering population separately: Widest known range in the last 20 years, except a major and reversible decline in the range is known to have taken place before	Not more than 10% deviation from baseline	Spatial: Sub-regional Temporal: Every six years	Spatial: National Temporal: Annual
		CI 4: Population abundance	For breeding birds: Annual relative breeding bird abundance For non-breeding birds Annual relative wintering bird abundance	Reference-based (modern) baseline: Highest breeding abundance estimates and wintering abundance estimates (separately) in the last 20 years	Deviation from baseline: annual relative breeding and wintering abundance > 0.7	Spatial: Sub-regional Temporal: Every 6 years, linked to IMAP reporting cycle, alternatively every 3 years linked to NE- Atlantic flyway count initiative	Spatial: Breeding population: National or sub-national (at least 40% of the national breeding population and certainly no less than 10% of the national population,) Non-breeding population: sub-national representative number of known sites
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored nests reproductive success Adult survival rates from capture- mark-resighting of monitored nests (colour-ringing of breeding adults) Immature survival rates from capture-mark- resighting (via colour ringing of chicks directly after hatching	Model-based baseline: Population growth rates in the last 6 to 12 years where data is available	Population growth rate to be set close to 1.0 over a 6 years average as requirement to reach GES	Spatial: Sub-regional Temporal: Annual: breeding success from sub-samples Every six years: adult and immature survival	Temporal: Annual Spatial: National or sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies Temporal: Annual: breeding success Every six years: adult and immature survival

3	Mediterranean Shag *Gulosus aristotelis desmarestii*	CI3: Species Distributional Range	Distribution of breeding colonies, and separately, distribution during non-breeding (July roosts)	Reference-based baseline for breeding and non-breeding population separately: Widest known range in the last 20 years, except a major and reversible decline in the range is known to have taken place before	Not more than 10% deviation from baseline, (potentially re- evaluated at higher threshold due to potentially strong fluctuations between years, alternatively: 10% deviation between averages)	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to MSFD reporting cycle
		CI 4: Population abundance	For breeding birds: Annual relative breeding bird abundance For non-breeding birds: Annual relative non-breeding bird abundance	Reference-based (modern) baseline: Highest breeding and non-breeding abundance estimates in the last 20 years	Deviation from baseline: Annual relative breeding and non-breeding abundance > 0.7	Spatial: Regional and sub-regional Temporal: Every six-years	Spatial: Breeding population: National or sub-national (at least 40% of the national breeding population and certainly no less than 10% of the national population) Non-breeding population: sub-national: relevant, representative sites during mid-winter counts Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored nests (alternatively count of fledglings pre- dispersal to reduce disturbance) Adult survival rates from capture-mark-resighting of monitored nests (colour-ringing of breeding adults) Immature survival rates from capture-mark-resighting (via colour ringing of chicks), additionally by ratio adult vs first year birds at roosts (July counts).	Model-based baseline: Population growth rates in the last assessment cycle	Deviation from baseline: Population growth rate of at least 1.0	Spatial: Regional and sub-regional Temporal: Every six year: adult and immature survival Annual: reproductive success	Spatial: National or sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies Relevant, representative sites for mid-winter counts Temporal: Annual

4	Audouin's Gull *Ichthyaetus audouinii*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Maximum range of breeding colonies as measured in the last 20 years, alternatively since implementation of the BD (1981)	Not more than 10% deviation from baseline	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National, surveys covering all known (major) breeding colonies per country Temporal: Annual highly recommended! (where not feasible 1 to 2 times within a 6 years reporting cycle)
		CI 4: Population abundance	For breeding birds in colonies: Annual relative breeding bird abundance For non-breeding birds during coastal mid-winter roost counts and at bottleneck during post-breeding/ post fledging migration (Gibraltar Strait): Annual relative non-breeding bird abundance	Reference-based (modern) baseline: Highest breeding and non-breeding abundance estimates in the last 20 years	Deviation from baseline: annual relative breeding and non-breeding abundance > 0.7	Spatial: Regional and sub-regional Temporal: Annual with reporting every six-years	Spatial: Breeding population: National or sub-national, all (larger) colonies Non-breeding population: sub-national, all known roost sites during mid- winter, bottleneck during outbound migration Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored colonies or subsamples Post-fledging, immature and adult survival rates modelled from capture-mark- resighting of birds colour-ringed as chicks in colonies Ratio of first winter versus adult birds from counts at bottleneck and mid-winter roosts for cross-assessment of reproductive output	Model-based population growth rate	Population growth rate 1.0 or higher	Spatial: Sub-regional Temporal: Annual: breeding success, immature and adult survival rates with reporting every six years	Spatial: National or sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies All important mid-winter roosts per country for ratio of adult versus 1st winter birds and reading of colour ringed individuals bottleneck (Gibraltar Strait) for ratio of adult versus 1st year during outbound migration Temporal: Annual for breeding success, adult and immature survival

5	Slender- billed Gull *Chroicocephalus genei*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Average range of breeding colonies as measured in the last 20 years, alternatively since implementation of the BD (1980)	Not more than 10% deviation from baseline	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National, surveys covering all known (major) breeding colonies per country Temporal: Annual if feasible, alternatively 1 to 2 times within a 6 years reporting cycle
		CI 4: Population abundance	For breeding birds in colonies: Annual relative breeding bird abundance For non-breeding birds during coastal mid-winter roost counts and at roosting areas during post- breeding. Annual relative non-breeding bird abundance	Reference-based (modern) baseline: Average breeding and non-breeding abundance estimates in the last 20 years	Deviation from baseline: Annual relative breeding and non-breeding abundance > 0.7	Spatial: Regional and sub-regional Temporal: Annual with reporting every six-years	Spatial: Breeding population: National or sub-national, all (larger) colonies Non-breeding population: sub-national, all known roost sites during mid- winter Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored colonies or subsamples Post-fledging, immature and adult survival rates modelled from capture-mark- resighting of birds colour-ringed as chicks in colonies Ratio of first winter versus adult birds from counts at bottleneck and mid-winter roosts for cross-assessment of reproductive output	Model-based population growth rate	Population growth rate 1.0 or higher	Spatial: Sub-regional Temporal: Annual: breeding success, immature and adult survival rates with reporting every six years	Spatial: National or sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies All-important mid-winter roosts per country for ratio of adult versus 1st winter birds and reading of colour ringed individuals Temporal: Annual for breeding success, adult and immature survival

6	Lesser- crested Tern *Thalasseus bengalensis emigratus*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Maximum range of breeding colonies as measured in the last 20 years	Not more than 10% deviation from baseline, set as a preliminary value, potentially to be set lower due to restricted range	Spatial: Sub-regional Temporal: Every six years	Annual for breeding success, adult and immature survival
		CI 4: Population abundance	For breeding birds in colonies: Annual relative breeding bird abundance For non-breeding birds during coastal mid-winter roost counts and at bottleneck during post-breeding/ post fledging migration (Gibraltar Strait) Annual relative non-breeding bird abundance	Reference-based (modern) baseline: Highest breeding and non-breeding abundance estimates in the last 20 years	Deviation from baseline: annual relative breeding and non-breeding abundance > 0.7	Spatial: Regional and sub-regional Temporal: Annual with reporting every six-years	Spatial: Breeding population: National or sub-national, all (larger) colonies Non-breeding population: sub-national, all known roost sites during mid- winter, bottleneck during outbound migration Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored colonies or subsamples Post-fledging, immature and adult survival rates modelled from capture-mark- resighting of birds colour-ringed as chicks in colonies Ratio of first winter versus adult birds from counts at bottleneck and mid-winter roosts for cross-assessment of reproductive output if feasible	Model-based population growth rate	Population growth rate 1.0 or higher	Spatial: Sub-regional, national (Libya) Temporal: Annual: breeding success, immature and adult survival rates with reporting every six years	Spatial: National or sub- national All colonies Representative subsample of nests/ chicks from these sample colonies All mid-winter aggregations per country for ratio of adult versus 1st winter birds and reading of colour ringed individuals bottleneck (Gibraltar Strait) for ratio of adult versus 1st year during outbound migration Temporal: Annual for breeding success, adult and immature survival, alternatively, breeding success every second year to reduce disturbance

7	Sandwich Tern *Thalasseus sandvicensis*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding and wintering birds % Shift in occupancy for breeding and wintering population	Maximum range of breeding colonies as measured in the last 20 years	Not more than 10% deviation from baseline	Spatial: Sub-regional Temporal: Every six years	Spatial: National Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to EcAp reporting cycles
		CI 4: Population abundance	Relative abundance for breeding and wintering birds	Reference-based (modern) baseline: Highest breeding and non-breeding abundance estimates in the last 20 years	Annual relative abundance > 0.7	Sub-regional Annual where feasible, with reporting every six- years	Sub-national: Breeding: high- and low-pressure areas > sample of nests Wintering: selection of high- and low-pressure areas or all known areas Temporal: annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored colonies or subsamples Post-fledging, immature and adult survival rates modelled from capture-mark-resighting of birds colour-ringed as chicks in colonies Ratio of first winter versus adult birds from counts at mid-winter roosts for cross-assessment of reproductive output if feasible	Model-based population growth rate	Population growth rate 1.0 or higher	Spatial: Regional, Sub-regional Temporal: Annual: breeding success, immature and adult survival rates with reporting every six years	Spatial: National or sub-national Temporal: Annual for breeding success, adult and immature survival, alternatively, breeding success every second year to reduce disturbance

8	Mediterranea n Storm- petrel *Hydrobates pelagicus melitensis*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Reference-based baseline: Widest known range in the last 20 years, except a major and reversible decline in the range is known to have taken place before	Not more than 10% deviation from baseline	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to EcAp reporting cycles
		CI 4: Population abundance	Annual relative breeding bird abundance	Reference-based (modern) baseline: Highest breeding abundance estimate in the last 20 years	Deviation from baseline: Relative annual abundance > 0.8	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National or sub-national (at least 40% of the national population and certainly no less than 10% of the national population, according to suggestions by UNEP/IMAP (2017)) Temporal: every 3 to 6 years
		CI5: Population Demographic Characteristics	Population growth rate: Adult survival rates from capture-mark-recapture of monitored colonies	Model-based baseline: Average population growth rates if available in the last 6 to 12 years	Average growth rate of at least 1.0	Spatial: Regional and sub-regional Temporal: Aiming at annual monitoring and assessment with reporting every six years	Spatial: National or sub-national, representative subsamples Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies Temporal: Annual

9	Scopoli's Shearwater *Calonectris diomedea*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Reference-based baseline: Widest known range in the last 20 years, except a major and reversible decline in the range is known to have taken place before	Not more than 10% deviation from baseline	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to EcAp reporting cycles
		CI 4: Population abundance	Annual relative breeding bird abundance supported by or substituted with raft counts where deemed suitable, following the confirmation of connectivity of rafts with certain colonies by means of GPS-tracking	Reference-based (modern) baseline: Abundance at the start of the implementation of BD (1980): needs to be discussed Highest breeding abundance estimate in the last 20 years	Deviation from baseline: Relative annual abundance > 0.8	Spatial: Regional or sub-regional Temporal: Aiming at annual monitoring and assessment with reporting every six	Spatial: National or sub-national (at least 40% of the national population and certainly no less than 10% of the national population, according to suggestions by UNEP/IMAP (2017)) Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored nests Adult survival rates from capture-mark-recapture of monitored nests	Model-based approach: Population growth rates over one assessment and reporting cycle	Population growth rate of at least 1.0	Spatial: Regional Temporal: Annual	Spatial: National or sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies Temporal: Annual

10	Yelkouan Shearwater *Puffinus yelkouan*	CI3: Species Distributional Range	% Change in occupancy in distribution range of breeding birds. % Shift in occupancy	Reference-based baseline: Widest known range in the last 20 years, except a major and reversible decline in the range is known to have taken place before	Not more than 10% deviation from baseline	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to EcAp reporting cycles
		CI 4: Population abundance	Annual relative breeding bird abundance by combination of methods including CMR in colonies; supported by land-based passage counts in the evening, combined with telemetry were deemed suitable	Reference-based (modern) baseline: Highest breeding abundance estimate in the last 20 years	Deviation from baseline: annual relative breeding abundance > 0.9	Spatial: Regional and sub-regional Temporal: Every six years	Spatial: National Temporal: Annual where feasible and depending on scale, alternatively one time to two times within six years, linked to EcAp reporting cycles
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success of monitored nests Adult survival rates from capture-mark-recapture of monitored nests	Model-based approach: Population growth rates over one assessment and reporting cycle	Population growth rate of at least 1.0	Spatial: Regional and sub-regional Temporal: Annual	Spatial: National or sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies Temporal: Annual

11	Balearic Shearwater *Puffinus mauretanicus*	CI3: Species Distributional Range	Distributional pattern: % change in occupancy in distribution range of breeding birds Distributional pattern: % change in at-sea distribution (50% KDE), modelled from representative number of tracked individuals and/or transect line counts % Shift in occupancy	Reference-based 'modern' baseline: Due to unfavorable conservation status (CR): maximum ranges (at sea and regarding breeding colonies) e.g. since start of the implementation of BD (1980)	No negative deviation in range size between assessment cycles due to precarious conservation status. Maximum 10% in range shift between assessment cycles	Spatial: Sub-regional (Balearic islands for breeding, Western Mediterranean Sea (mainly) for at-sea distribution during breeding (relevant OSPAR sub-region during non-breeding) Temporal: Every six years	For breeding range: Balearic Islands, covering at least all known breeding areas Temporal: Annual
		CI 4: Population abundance	Annual relative breeding bird abundance Annual count net maxima of individuals passing bottleneck on migration	Reference-based (modern) baseline: Highest breeding abundance estimate in the last 20 years	Deviation from baseline: annual relative breeding abundance annual relative breeding abundance 1.0 or larger	Spatial: Regional (Western Mediterranean Sea) Temporal: Aiming at annual monitoring and assessment with reporting every six years	Spatial: Sub-national (ideally 100% but at least 90% of the population) Temporal: Annual
		CI5: Population Demographic Characteristics	Population growth rate Reproductive success Adult survival rates from capture-mark-recapture of monitored nests	Model-based approach: Population growth rates over one assessment and reporting cycle	Population growth rate 1.0 or higher	Spatial: sub-regional Temporal: Annual with reporting every six years	Spatial: Sub-national Representative sample of colonies from high pressure vs protected areas Representative subsample of nests from these sample colonies Temporal: Annual

4.5 Monitoring and Assessment Scales, Assessment Criteria, Thresholds and Baseline Values for the IMAP Common Indicators 6 related to Non-Indigenous Species (NIS)

27. The NIS-related assessment criteria were developed with the support of the Biodiversity Online Working Group, was reviewed at multiple stages: Meeting of the Ecosystem Approach Correspondence Group on Monitoring (CORMON) for Biodiversity and Fisheries – Videoconference, 10–11 June 2021 (UNEP/MED WG.500/7); 15th Meeting of SPA/BD Focal Points – Videoconference, 23–25 June 2021 (UNEP/MED WG.502/16.Appendix E); CORMON Biodiversity and Fisheries Meeting – Videoconference, 28–29 March 2022 (UNEP/MED WG.520/Inf.3).

28. Although no Mediterranean-wide threshold values have yet been established for CI6, the document highlights the importance of setting them at the subregional level (e.g., WMED, CMED, Adriatic, Aegean-Levantine), taking into account recent data (from the 2000s onward), regional introduction pressures, and the level of monitoring effort. It proposes that thresholds could be expressed as a percentage reduction in new NIS introductions, with further input from regional experts in taxonomy, monitoring, ecology, and management. The latter was tested during the 2023 MED QSR preparation and will continue to be improved during the development of the third version of MED QSR.

Assessment Criteria:

29. Assessment criteria for preparing validated check lists of NIS to be used for assessing GES include a) taxa (all taxa or excluding phytoplankton, parasites); b) species to be considered in trends indicator (extinct species, cryptogenic species, crypto-expanding, questionable species); c) pathways to be considered (all pathways or excluding unaided expanding species, e.g. Lessepsian immigrants).

30. Partly native species, NIS introduced through natural dispersal, unicellular marine algae, parasites, extinct and freshwater species should be reported in NIS lists but considered in CI6 assessments on a case-by-case basis.

Spatial and Temporal Scales of Monitoring and Assessment:

31. Broad Geographic Units: Assessment of threshold values based on the trends indicator (CI6) calculated to date can be achieved at the basin and country level, although it is more meaningful to be assessed at the subregional level (i.e. EcAp subregional units) and, accordingly, at the national part of a subregion for each country, e.g. Greece: EMED, CMED, ADRIA; Italy: WMED, CMED, ADRIA, Tunisia: WMED, CMED.

32. Broad Temporal Scales: For consistency and harmonization reasons, it is recommended that the assessment period of CI6 should be the same across all Mediterranean countries and follow the assessment and reporting 6-year periods already established for EU countries under the MSFD.
Finer scales for NIS monitoring

33. At basin scale, there are no established standard protocols for the monitoring of NIS. However, guidelines for monitoring NIS in the Mediterranean were developed and endorsed by the CPs to the Barcelona Convention in 2019 under the framework of the EcAp/IMAP (UNEP/MED WG.467/16 (2019) "Monitoring Protocols for IMAP Common Indicators related to Biodiversity and Non-Indigenous species").

34. The majority of countries do not have a dedicated strategy but have a monitoring strategy including marine NIS applied either at hot-spot areas of the country (i.e. ports, aquaculture units, marine protected areas) or in specific subregions through a related network of sampling stations. Targets of NIS monitoring include mainly the detection of new NIS and the measurement of abundance/coverage/biomass of established and/or invasive NIS, while only a small number of countries monitor the impact of established/invasive NIS on the native communities.

35. The IMAP Common Indicator Guidance propose more intense monitoring effort at "hot-spots" and "steppingstone areas" for non-indigenous species introductions, e.g. sampling at least once a year at ports and their wider area and once every two years in smaller harbours, marinas, and aquaculture sites. Importantly, the same sites should be surveyed each monitoring period, to avoid biases potentially caused by differences among sites.

Threshold Values

36. Currently, threshold values for the number of new introductions of non-indigenous species have not been set neither at the EU or the Mediterranean level. Ongoing work in the framework of the MSFD (Tsiamis et al., 2021b) has concluded that the most suitable approach for setting threshold values for D2C1 is to adopt the percentage reduction of new NIS and the exact value of percentage reduction should be decided at regional and/or subregional scale, based on the pathways pressure and level of monitoring coverage of each region/subregion.

37. Preliminary analysis of the available data for the Mediterranean between 1970-2017 for the purposes of this report demonstrated that there is a significant increase in the rate of new NIS entering all EcAp subregions after 2000 (presumably as a result of increased scientific effort) and that this parameter is significantly different between EcAp subregions. Consequently, the initial recommendations are that i) the threshold values for CI6 in the Mediterranean need to be set at subregional level and not at regional level and ii) we need to consider data only after 2000s in order to establish today's threshold values. Furthermore, for Mediterranean region/subregions that have not been efficiently monitored in terms of NIS during the previous decades, a shorter time span of 6-years cycle periods should be preferred, e.g. 3 years.

38. Conclusively, threshold values should be established separately for each of the Mediterranean subregions and should be sought by examining the data of the last two decades, if not an even more recent time period. At the same time, a consensus needs to be reached about which species groups will be included in the calculations and how their environmental impact will be taken into account. These are decisions that will determine the definition of GES for EO2 and will affect the management obligations of Contracting Parties to the Barcelona Convention. As such, it is proposed that further work takes into account the contribution of regional experts not only from the fields of taxonomy, monitoring and assessment but also conservation and management and last, but not least, ecologists with strong statistical/mathematical background

39. The baseline for IMAP Common Indicator 6 related to Non-Indigenous Species (NIS) has been reviewed through a series of regional consultation and review meetings:

- CORMON Biodiversity and Fisheries (Videoconference, 10–11 June 2021) UNEP/MED WG.500/8
- Fifteenth Meeting of SPA/BD Focal Points (Videoconference, 23–25 June 2021) UNEP/MED WG.502/16.Appendix F
- Follow-up CORMON Biodiversity and Fisheries Meeting (Videoconference, 28–29 March 2022) UNEP/MED WG.520/5
- 9th Meeting of the Ecosystem Approach Coordination Group (Videoconference, 5 July 2022) UNEP/MED WG.521/Inf.8

40. The progress achieved in the development of national and subregional NIS baselines has been acknowledged by the Ecosystem Approach Coordination Group (EcAp CG), which endorsed their use in the 2023 Mediterranean Quality Status Report (Med QSR) and encouraged their further refinement during future IMAP implementation cycles.

41. The regional baseline includes only validated species records observed up to the end of 2020, harmonizing regional and subregional inventories and updating national lists (including the JRC baselines for EU Mediterranean countries).

42. A total of 1,011 non-indigenous species (NIS) have been recorded in Mediterranean marine waters, of which 748 are considered established—an overall establishment rate of nearly 74%, varying by subregion. These include 144 Macrophytes, 224 Mollusca, 188 Arthropoda, 203 Chordata, 83 Annelida, 33 Bryozoa, 42 Cnidaria, 47 Foraminifera, and 47 other taxa. Alien status and record validity have been clarified for most species. Where information was lacking, data-deficient and questionable records were compiled at regional and subregional levels.

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Appendix 8

Draft Decision IG.27/6

Ecosystem Approach (EcAp) Policy and Roadmap 2026-2035 and Integrated Monitoring and Assessment Programme for the Mediterranean Sea and Coast (IMAP)

[**<u>Draft Decision IG.27/6</u>**

Ecosystem Approach (EcAp) Policy and Roadmap 2026-2035 and Integrated Monitoring and Assessment Programme for the Mediterranean Sea and Coast (IMAP)

The Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean, and its Protocols, at their 24th meeting,

Welcoming the outcome document of the 2025 United Nations Conference to Support the Implementation of Sustainable Development Goal (SDG) 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development (UNOC-3, Nice, France, June 2025) entitled "Our ocean, our future: united for urgent action", reaffirming the strong global commitment to conserve and sustainably use the ocean, seas and marine resources and reconfirming the need to strengthen the role of regional seas conventions and action plans,

Being inspired by the high-level celebration of the anniversary of the 50 years of the United Nations Environment Programme/Mediterranean Action Plan (UNEP/MAP) and the 30 years of the Post-Rio Barcelona Convention, at UNOC-3, on 10 June 2025, as a strong sign of renewed commitment of the Contracting Parties, as reflected in their Ministerial Declaration,

Recalling the United Nations General Assembly Resolution 76/296 of July 2022, entitled "Our Ocean, Our future, Our responsibility",

Referring to the United Nations Environment Assembly Resolutions 6/15 of March 2024, on strengthening ocean efforts to address climate change, marine biodiversity loss, and pollution, which underscores the need to implement regional seas conventions, protocols, and action plans for the protection and conservation of the marine and coastal environment; 3/10 of December 2017, on addressing water pollution in inland, coastal, and marine ecosystems to protect and restore water-related ecosystems, as well as the related Action Plan for its implementation; 5/8 of March 2021, on establishing a science-policy panel to provide countries with independent, policy-relevant scientific advice on chemicals, waste, and pollution prevention; 5/14 of March 2022, which set the basis for the process on developing an international legally binding instrument to end plastic pollution,

Recalling the Barcelona Convention and its Protocols and the respective provisions for enhancing EcAp Policy and Roadmap implementation,

Recalling further Decisions IG.17/6 of COP 15 (Almeria, Spain, 2008); IG.20/4 of COP 17 (Paris, France, 2012); IG.21/3 of COP 18 (Istanbul, Türkiye, 2013); and IG.25/3 of COP 22 (Antalya, Türkiye, 2021) on EcAp Policy implementation,

Recalling also Decisions IG.22/7 of COP 19 (Athens, Greece, 2016); IG.23/6 of COP 20 (Tirana, Albania, 2017); IG.24/4 of COP 21 (Naples, Italy, 2019); IG.25/10 of COP 22 (Antalya, Türkiye, 2021); and IG.26/3 of COP 23 (Portorož, Slovenia, 2023) on IMAP implementation and development of the Mediterranean Quality Status Reports (MED QSR),

Considering the findings and policy recommendation of the 2023 MED QSR including its Executive Summary and Summary for Policy Makers, as well as the work guided by the Ecosystem Approach Correspondence Groups on Monitoring (CORMONs), as well as of the Ecosystem Approach Coordination Group Meetings,

Appreciating the work conducted by the Contracting Parties to establish and make operational national IMAP-based monitoring programmes for the IMAP Ecological Objectives and respective Common Indicators, including data generation,

Considering the developments within the European Union (EU) Marine Strategy Framework Directive (MSFD), including its assessment as well as of the Programmes of Measures (PoMs), as an important mechanism to support EcAp implementation,

Considering the developments within the Regional Seas Conventions on the monitoring and assessment of marine environment, 1.*Approve* the following Ecological Vision for the Mediterranean Sea and Coast:

"Progress towards a healthy, clean, pollution free sustainable and climate resilient Mediterranean Sea and Coast with productive and biologically diverse marine and coastal ecosystems, where the 2030 Agenda for sustainable development and its SDGs are achieved through the effective implementation of the Barcelona Convention, its Protocols and the Mediterranean Strategy for Sustainable Development for the benefit of people and nature.";

2.*Agree to apply* the following EcAp Strategic Goals for the Mediterranean (2026-2035):

a) *To protect enhance environmental conditions allowing natural recovery and, where practicable based on national priorities, restore the structure and function of marine and coastal ecosystems thus also protecting biodiversity, in order to achieve and maintain Good Environmental Status and allow for their sustainable use;*
b) *To reduce pollution from different sources in the marine and coastal environment so as to minimize impacts on, and risks to, human and/or ecosystem health and/or uses of the sea and the coasts ~~and reduce the pollution from different sources~~;*
c) *To prevent, reduce and manage the vulnerability of the sea and the coasts to risks induced by human activities, including climate change and natural event.*

3.*Adopt* the MAP EcAp Policy and Roadmap 2026-2035, presented in Annex I, including its 6 implementation steps, ecological objective, operational objectives, indicators, Good Environmental Status (GES) definitions and targets, timeline, and governance structure for guiding EcAp implementation,

4.*Reaffirms* the EcAp governance structure through Ecosystem Approach Coordination Group Meeting (EcAp CG), Correspondence Groups on monitoring (CORMONs), Correspondence Group on Economic and Social Analysis (COR ESA) and ad-hoc Online Working Groups (OWG), to this aim *adopts* the Terms of References and flow of interaction as presented in Annex I,

5.*Request* the Contracting Parties to ensure full implementation of EcAp as the primary drive to progress towards a healthy, clean, sustainable and climate resilient Mediterranean Sea and Coast, and to achieve GES, noting that in case of any discrepancy, the terms and contents of this decision override those of all other decisions,

6.*Invite* the Contracting Parties to provide the necessary financial and institutional support for the effective implementation of the National Action Plans/Programmes of Measures (NAPs/PoMs'), as well as for the monitoring and assessment of marine and coastal environment,

7.*Encourage* partners, competent organizations, scientific community, citizens and private sector to fully consider the vision, strategic goals and other elements of EcAp Policy and Roadmap, strengthen their work to ensure continued efforts for its implementation,

8.*Adopt* the third cycle of IMAP based on an 8-year cycle, presented in Annex II, and *approve* the assessment criteria while noting their evolving nature based on quality-assured data availability and progress towards GES,

9.*Request* the Contracting Parties to streamline IMAP implementation, in line with their national specificities,

10.*Promote* Science-Policy Interface to enhance evidenced-based policy making,

11.*Take into account* the differences in the monitoring capacities of the Contracting Parties and the need to further enhance capacity building and technical assistance for implementation; giving particular attention to newly introduced common and candidate indicators on primary basis,

12.*Invite* the Contracting Parties, with the support of the Secretariat, to update their national monitoring programmes in light of the updated elements of IMAP and to report regularly quality-assured data;

13.*Encourage* the Contracting Parties, with the support of the Secretariat, to undertake joint monitoring initiatives, exchange best practices, use harmonized monitoring and assessment methodologies, ensure cost efficiency, and apply the region-wide agreed assessment criteria under IMAP;

14.*Invite* the Secretariat, in collaboration with the Contracting Parties, to engage with relevant international financing institutions, regional and international organizations, the private sector, and other relevant stakeholders to identify and pursue opportunities for mobilizing financial resources in support of the implementation of the updated NAPs/PoMs and enhanced national capacities for IMAP implementation;

15.*Urge* the Contracting Parties to implement the NAPs/PoMs and accelerate progress towards achieving GES in the Mediterranean, enhance coherence with other national policies and strategies, and regularly report on their implementation pursuant to Article 13 of the Protocol for the Protection of the Mediterranean Sea Against Pollution from Land-Based Source (LBS Protocol), while securing enabling conditions for their long-term sustainability within the broader context of global efforts to address the combined threats of the triple planetary crisis - climate change, biodiversity loss and pollution - and the regional commitment to implement the Mediterranean Strategy for Sustainable Development for the period 2026-2035, as a strategic regional cooperation framework to upscale sustainable and climate resilient development pathways;

16.*Invite* partners, as well as regional and international organizations to support IMAP and NAPs/PoMs implementation, and use all available means, mechanisms and facilities to contribute to achieving GES in the Mediterranean;

17.*Request* the Secretariat to allocate adequate financial resources in line with the Programme of Work to support the Contracting Parties for the implementation of the updated IMAP-based national monitoring programmes; and

18. *Request* the Secretariat to upgrade the IMAP InfoSystem not only to serve as a data repository but also to generate assessment products, and the Contracting Parties to effectively and timely submit IMAP generated data in line with the monitoring frequency of the respective Common Indicators, as indicated in the respective Indicator Guidance Factsheets.]

Annex I

EcAp Policy and Roadmap (2026 – 2035)

Annex II

Integrated Monitoring and Assessment Programme for the Mediterranean Sea and Coast and Related Assessment Criteria (IMAP) (Third Cycle).