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Agenda item 4: Progress achieved regarding implementation of the Programme of Work 2020-2021 related to Land-Based Pollution and Governance Themes

Assessment of the Capacities of National Laboratories responsible for Monitoring of IMAP Common Indicators 13, 14, 17, 18 and 20

Table of Contents

List of Abbreviations / Acronyms

COP	Conference of the Parties
CORMON	Correspondence Group on Monitoring
CRM	Certified Reference Material
DQA	Data Quality Assurance
EACs	Environmental Assessment Criteria
IAEA	International Atomic Energy Agency
ILC	Interlaboratory Comparison
IMAP	Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria
MAP	Mediterranean Action Plan
MED POL	Programme for the Assessment and Control of Marine Pollution in the Mediterranean Sea
MESL	Marine Environment Studies Laboratory of the IAEA Environmental Laboratories in Monaco
PCBs	Polychlorinated Biphenyls
PT	Proficiency Test
QA/QC	Quality Assurance/Quality Control
TC	Training Course
TE	Trace Elements

1 Introduction

1. In May 2020 seven questionnaires in a form of Excel files were sent to MEDPOL Focal Points for their feedback. The questionnaires were dedicated to assessment of national IMAP competent laboratories to implement following IMAP Common Indicators:

a. CI 13 and CI 14: Eutrophication;
b. CI 17: Trace Element and Organic Contaminants in Biota;
c. CI 17: Trace Element and Organic Contaminants in Sediment;
d. CI 17: Trace Element and Organic Contaminants in Seawater;
e. CI 18: Biomarkers;
f. CI 20: Seafood safety monitoring.

2. The following ten Contracting Parties returned information: Albania, Bosnia and Herzegovina, Croatia, Cyprus, Egypt, Italy, Montenegro, Slovenia, Spain, and Turkey. The number of laboratories and countries providing inputs varied for different CIs and matrices for CI17.

3. A comprehensive evaluation of the laboratories has been undertaken by IAEA/MESL expert team under MEDPOL guidance. For each laboratory the evaluation findings are elaborated in present document, as well as in Annex I, whereby the codes are randomly assigned on individual basis. This approach has been applied to avoid revealing a status of assessed laboratories; however still allowing for identification of the gaps related to specific laboratories.

4. The lack of response from the remaining counties, as well as the fact that many questionnaires were returned incomplete, did not allow for a full analysis across the region. The present evaluation serves two purposes:

a) The verification that laboratories are complying with the methods proposed in relevant IMAP Monitoring Guidelines/Protocols;
b) To support further application of the IMAP Monitoring Guidelines/ Protocols from Mediterranean laboratories.

2 Evaluation criteria

5. The evaluation was undertaken to reflect a compliance of the national laboratories` analytical practice with the methods described in the IMAP monitoring guidelines for CI13, 14, 17, 18 and 20. The evaluation of laboratories was provided i) in a narrative form which can be found in this document, and ii) numerically, in a form of tables provided in the Annex I. In this per-laboratory evaluation each topic (e.g. sampling, sample preparation, digestion, analysis, etc.) scored one of three different values: ‘1’ for full compliance with the guidelines, or accredited method used; ‘0’ for no reply; or method used is not recommended in the guidelines, nor accredited. The score value of ‘0.5’ is given for partial compliance with the guidelines. The capacity assessment scoring explanations given below in the paragraphs dealing with the associated capacities can also be found in Tables 1-2 of Annex I for CIs 13 and CI 14 of EO 5 related to eutrophication and in Tables 3-6 of Annex I for CI 17 of EO9 related to contaminants in different matrices. Since only 2 laboratories returned actual answers in their questionnaires for CI 18 related to biomarkers, only the narrative evaluation was performed. Likewise, only a limited number of laboratories returned replies to questionnaires for CI20, therefore the narrative evaluation contains much relevant details and is not repeated in a tabular form.

3 Assessment of capacity to monitor IMAP Common Indicators 13 and 14

6. The evaluation of national laboratories` capacity to monitor IMAP CIs 13 and 14 respectively key nutrients and chlorophyll a, as well as general hydrographic parameters, was undertaken in compliance with the IMAP Guidance Factsheets (UNEP/MED WG.467/5, 2019)[1] and newly

[1] UNEP/MED WG.467/5, 2019. IMAP Guidance Factsheets: Update for Common Indicators 13, 14, 17, 18, 20 and 21; New proposal for Candidate Indicators 26 and 27.

developed Monitoring Guidelines/Protocols (UNEP/MED WG.482/5-10[2,3,4,5,6,7], 2020), as well as the Monitoring Guidelines for Analytical Quality Assurance (UNEP/MED WG.492/7, 2020)[8] and Reporting Monitoring Data (UNEP/MED WG.492/7, 2020)[9].

7. The great majority of laboratories that provided their feedback to the questionnaires have the capacity to monitor parameters related to CIs 13 and 14. However, only 6 out of 22 laboratories claimed to report data related to eutrophication. Many laboratories used other than methods recommended in the guidelines for collection of monitoring data.

8. One of the issues that emerged is the use of CTD in providing data related to measurement of dissolved oxygen and chlorophyll *a*. This issue has to be properly weighted in the future as it introduces great variability in the data if the probes are not regularly calibrated, as well as the sensors of optimal quality are not used. Also, in relation to reporting CTD data, it is important to decide which level of data postprocessing has to be applied on the originally generated field survey data.

9. Only a few laboratories reported issues that impact their performance; they were the requirement of new equipment (1) and the lack of annual access to PTs and CRMs (2).

10. The numerical evaluation of coded laboratories and specific steps can be found in Table 2 of Annex I.

4 Assessment of capacity to monitor IMAP Common Indicator 17

11. The monitoring of mandatory contaminants related to IMAP CI 17, respectively heavy metals (Cadmium (Cd), Lead (Pb) and total Mercury (THg)), organochlorinated compounds (PCBs, hexachlorobenzene, lindane and ΣDDTs) and Polycyclic Aromatic Hydrocarbons (US EPA 16 Reference PAHs compounds), was included in previous MEDPOL monitoring programme.

12. The following most important overall issues for improvement in the analysis of heavy metals and organic contaminants in three matrices were raised:

- Biota: i) accessibility to quality assurance tools, such as interlaboratory comparisons (ILCs), proficiency tests (PTs) or certified reference materials (CRMs) were listed by 6 laboratories and ii) the lack of training and adequate laboratory equipment or solvents was listed by 5 laboratories;
- Sediment: i) the accessibility to quality assurance tools, such as interlaboratory comparisons (ILCs), proficiency tests (PTs) or certified reference materials (CRMs) were listed by 7 laboratories; and ii) the lack of training and adequate laboratory equipment or solvents was listed by 6 laboratories. One laboratory had problems with keeping trained staff;
- Seawater i) accessibility to quality assurance tools, such as interlaboratory comparisons (ILCs), proficiency tests (PTs) or certified reference materials (CRMs) were listed by 5 laboratories; ii) the lack of training was claimed by 1 laboratory only and iii) the lack of adequate laboratory equipment or solvents was listed by 6 laboratories; iv) the lack of a stabile seawater CRM was specifically mentioned.

[2] UNEP/MED WG.482/5, 2020, Monitoring Guidelines/Protocols for Sampling and Sample Preservation of Seawater for IMAP Common Indicators 13 and C14: Concentration of Key Nutrients and Chlorophyll a.
[3] UNEP/MED WG.482/6, 2020, Monitoring Guidelines/Protocols for Determination of Hydrographic Physical Parameters.
[4] UNEP/MED WG.482/7, 2020, Monitoring Guidelines/Protocols for Determination of Hydrographic Chemical Parameters
[5] UNEP/MED WG.482/8, 2020, Monitoring Guidelines/Protocols for Determination of Concentration of Key Nutrients in Seawater – Nitrogen Compounds
[6] UNEP/MED WG.482/9, 2020, Monitoring Guidelines/Protocols for Determination of Concentration of Key Nutrients in Seawater – Phosphorous and Silica Compounds
[7] UNEP/MED WG.482/10, 2020, Monitoring Guidelines/Protocols for Determination of Chlorophyll a in Seawater.
[8] UNEP/MED WG.492/7, 2021, Monitoring Guidelines/Protocols for Analytical Quality Assurance for IMAP Common Indicators 13, 14, 17, 18 and 20.
[9] UNEP/MED WG.492/8, 2021, Monitoring Guideline on Reporting Monitoring Data for IMAP Common Indicators 13, 14, 17, 18 and 20.

13. Below showed assessment of the national laboratories` capacity provide summarized specific information on present state of play grouped for biota, sediment and seawater matrixes, in line with the numerical evaluation of coded laboratories provided in Tables 3-6 of Annex I.

4.1. Monitoring of parameters related to biota matrix

14. The evaluation of laboratories` procedures was done in compliance with the IMAP Guidance Factsheets (UNEP/MED WG.467/5, 2019)[10] and newly developed Monitoring Guidelines/Protocols UNEP/MED WG.482/13, 2020[11]; and UNEP/MED WG.482/14, 2020[12]), as well as the Monitoring Guidelines for Analytical Quality Assurance (UNEP/MED WG.492/7, 2021) and Reporting Monitoring Data (UNEP/MED WG.492/7, 2021).

15. The evaluation confirms that the sampling for biota is inconsistent. Some laboratories get biota samples delivered to their laboratories, others only sample bivalves or fish, but not both. Only one laboratory analyses biota for PT purposes.

4.2. Monitoring of parameters related to sediment matrix

16. The evaluation of laboratories procedures was done in compliance with the IMAP Guidance Factsheets (UNEP/MED WG.467/5, 2019) and newly developed Monitoring Guidelines/Protocols (UNEP/MED WG.482/11, 2020[13]; and UNEP/MED WG.482/12, 2020[14]), as well as the Monitoring Guidelines for Analytical Quality Assurance (UNEP/MED WG.492/7, 2021) and Reporting Monitoring Data (UNEP/MED WG.492/7, 2021).

17. There is a discrepancy in the sample preparation and 4 laboratories are using bulk sediment (without sieving) or did not report how sediment is prepared, while 5 laboratories are using different sediment fraction (< 63 μm) for analysis. Many laboratories are not using hydrofluoric acid (HF) in the digestion of sediment for subsequent trace element analysis. These deviations from the IMAP recommended methods will most likely result in contaminants` concentrations not comparable with data obtained.

4.3. Monitoring of parameters related to seawater matrix

18. The evaluation of laboratories procedures was done in compliance with the IMAP Guidance Factsheets (UNEP/MED WG.467/5, 2019) and newly developed Monitoring Guidelines/Protocols (UNEP/MED WG.482/15, 2020[15]; and UNEP/MED WG.482/16, 2020[16]), as well as the Monitoring Guidelines for Analytical Quality Assurance (UNEP/MED WG.492/7, 2021) and Reporting Monitoring Data (UNEP/MED WG.492/7, 2021).

19. Despite the challenges associated with contamination-free sampling of seawater for trace elements and organic contaminants, many of laboratories replied to have adequate sampling and sample preparation and preservation in place, without providing more details. However, the laboratories do not report monitoring data related to seawater matrix in IMAP Pilot Info System. In that respect it should be noted that seawater is not included in the mandatory matrices to be analysed in the framework IMAP, and therefore seawater monitoring is carried out on a country decision basis, including selection of contaminants that countries consider more appropriate and technically feasible for monitoring.

[10] UNEP/MED WG.467/5, 2019. IMAP Guidance Factsheets: Update for Common Indicators 13, 14, 17, 18, 20 and 21; New proposal for Candidate Indicators 26 and 27.
[11] UNEP/MED WG.482/13, 2020, Monitoring Guidelines/Protocols for Sampling and Sample Preservation of Marine Biota for IMAP Common Indicator 17: Heavy and Trace Elements and Organic Contaminants
[12] UNEP/MED WG.482/14, 2020, Monitoring Guidelines/Protocols for Sample Preparation and Analysis of Marine Biota for IMAP Common Indicator 17: Heavy and Trace Elements and Organic Contaminants
[13] UNEP/MED WG.482/11, 2020, Monitoring Guidelines/Protocols for Sampling and Sample Preservation of Sediment for IMAP Common Indicator 17: Heavy and Trace Elements and Organic Contaminant
[14] UNEP/MED WG.482/12, 2020, Monitoring Guidelines/Protocols for Sample Preparation and Analysis of Sediment for IMAP Common Indicator 17: Heavy and Trace Elements and Organic Contaminants.
[15] UNEP/MED WG.482/15, 2020, Monitoring Guidelines/Protocols for Sampling and Sample Preservation of Seawater for IMAP Common Indicator 17: Heavy and Trace Elements and Organic Contaminants.
[16] UNEP/MED WG.482/16, 2020, Monitoring Guidelines/Protocols for Sample Preparation and Analysis of Seawater for IMAP Common Indicator 17: Heavy and Trace Elements and Organic Contaminants.

5 Assessment of the national laboratories` capacity to monitor IMAP Common Indicator 18

20. Only 4 questionnaires from 4 countries were returned. Two of them did not contain any information, i.e. questions were not answered. Thus, only two laboratories from 2 countries provided information on their status regarding their monitoring efforts related to biomarkers.

21. One laboratory reported it only performs the Micronuclei Frequency (MNi) in both fish and bivalves. However, it does not provide any information on their Quality Assurance (QA) measures.

22. The second laboratory providing replies on its monitoring efforts related to biomarkers is fully compliant with the MEDPOL requirements as provided in the IMAP Guidance Factsheets (UNEP/MED WG.467/5, 2019) and newly developed Monitoring Guidelines/Protocols for CI 18 (UNEP/MED WG.492/3, 202117, UNEP/MED WG.492/4, 202118, UNEP/MED WG.492/5, 202119), as well as the Monitoring Guidelines for Analytical Quality Assurance (UNEP/MED WG.492/7, 2021) and Reporting Monitoring Data (UNEP/MED WG.492/7, 2021).

6 Assessment of the national laboratories` capacity to monitor IMAP Common Indicator 20

23. The evaluation of laboratories procedures was done in compliance with the IMAP Guidance Factsheets (UNEP/MED WG.467/5, 2019) and newly developed Monitoring Guidelines/Protocols (UNEP/MED WG.482/17[20], 2020; and UNEP/MED WG.482/18[21], 2020), as well as the Monitoring Guideline for Analytical Quality Assurance (UNEP/MED WG.492/7, 2021) and Reporting Monitoring Data (UNEP/MED WG.492/7, 2021).

24. Only 10 laboratories from 7 countries reported information on their status regarding seafood monitoring. Detail narrative findings are provided in UNEP/MED WG.492/inf. 10, whilst key findings are presented here-below.

25. Concerning QA, most laboratories report the use of CRMs and participation in PTs, some of them specifically referred to the PTs organized by IAEA/MESL in collaboration with MEDPOL for CI17 in biota matrix.

26. In summary, while not many laboratories provided information about their seafood monitoring for heavy metals and organic contaminants most of them appear to be well-organized and in general complying with the IMAP Monitoring Guidelines. Most laboratories that replied to the CI20 questionnaire are the same as those in charge for biota matrix of CI17; only one laboratory was in charge for CI20.

7 The recommendations on the way forward

27. The findings of the assessment of capacities of 36 different national IMAP competent laboratories as presented in this document provide a good insight on their capability to comply with the monitoring requirements of the IMAP monitoring for Common Indicators 13, 14, 17, 18 and 20. The following specific knowledge and technical needs of individual laboratories are recognized: i) further harmonization of laboratories` performance in line with IMAP Monitoring Guidelines in order to increase the representativeness and accuracy of the analytical results needed for generation of quality-assured monitoring data; ii) improved availability of appropriate analytical equipment to strengthen technical capacities of national IMAP competent laboratories; iii) increased consistency of biota sampling along with application of Quality Assurance measures; iv) increased accessibility to quality assurance tools, such as inter-laboratory comparisons (ILCs), proficiency tests (PTs) or certified reference materials (CRMs); therefore, along with continual strengthening of the capacities through the Proficiency Tests and Training Courses for trace elements and organic contaminants with

[17] UNEP/MED WG.492/3, 2021, Monitoring Guideline/Protocols for Sampling and Sample Preservation of Marine Molluscs (such as Mytilus sp.) and Fish (Mullus barbatus) for IMAP Common Indicator 18.
[18] UNEP/MED WG.492/4, 2021, Monitoring Guideline/Protocols for Biomarker Analysis of Marine Molluscs (such as Mytilus sp.) and Fish (Mullus barbatus) for IMAP Common Indicator 18 – Analysis of Lysosomal membrane stability (LMS).
[19] UNEP/MED WG.492/5, 2021, Monitoring Guideline/Protocols for Biomarker Analysis of Marine Molluscs (such as Mytilus sp.) and Fish (Mullus barbatus) for IMAP Common Indicator 18 – Analysis of and micronuclei (MNi) frequency, Acetylcholinesterase (AChE) activity and Stress on Stress (SoS).
[20] UNEP/MED WG.482/17, 2020, Monitoring Guidelines/Protocols for Sampling and Sample Preservation of Sea Food for IMAP Common Indicator 20: Heavy and Trace Elements and Organic Contaminants.
[21] UNEP/MED WG.482/18, 2020, Monitoring Guidelines/Protocols for Sample Preparation and Analysis of Sea Food for IMAP Common Indicator 20: Heavy and Trace Elements and Organic Contaminants

assistance of UNEP/MAP – MEDPOL and IAEA/MESL, further regular inter-laboratory comparisons/proficiency testing will be established for the analysis of nutrients, biomarkers and contaminants in commonly consumed seafood.

28. The assessment of the capacities of national IMAP competent laboratories should be continued as a biennial effort aimed at gradual improvement of their performances with a view of reaching optimal compliance of data processing and reporting with the methods recommended in Monitoring Guidelines for IMAP Common Indicators 13,14,17, 18 and 20.

29. To that effect, a decision should be undertaken on applying the assessment questionnaires as a regular and mandatory action, whilst their form may be further improved to make both the reply and the evaluation easier. Evaluation findings based on application of the assessment questionnaires will be shown in national reports prepared per country in order to provide more detail guidance of relevance for quality assurance activities that will be regularly performed in collaboration with IAEA/MESL.

Annex I

Numeric evaluation

Assessment of the national laboratories` capacity to monitor IMAP Common Indicators 13, 14 and 17:

Numerical evaluation

30. The evaluation was undertaken to reflect a compliance of the national laboratories` analytical practice with the methods described in the IMAP Monitoring guidelines for CI13, 14, 17, 18 and 20. The evaluation of laboratories was provided i) in a narrative form which can be found in the document UNEP/MED WG.492/10, and ii) numerically, in a form of tables provided in this information document.

31. In this per-laboratory evaluation each topic (e.g. sampling, sample preparation, digestion, analysis, etc.) scored one of three different values: '1' for full compliance with the guidelines, or accredited method used; '0' for no reply; or method used is not recommended in the guidelines, nor accredited. The score value of '0.5' is given for partial compliance with the guidelines.

32. The capacity assessment scoring explanations elaborated in UNEP/MED WG.492/10 are presented here-below in Tables 1-2 for CIs 13 and CI 14 of EO 5 related to eutrophication and in Tables 3-6 for CI 17 of EO9 related to contaminants in different matrices.

33. Since only 2 laboratories returned actual answers in their questionnaires for CI 18 related to biomarkers, only the narrative evaluation was performed. Likewise, only a limited number of laboratories returned replies to questionnaires for CI20, therefore the narrative evaluation contains much relevant details and is not repeated in a tabular form. Detail narrative findings are provided in section 2 of present document.

8 Assessment of capacity to monitor IMAP Common Indicator 20

34. The evaluation of laboratories procedures was done in compliance with the IMAP Guidance Factsheets (UNEP/MED WG.467/5, 2019) and newly developed Monitoring Guidelines/Protocols (UNEP/MED WG.482/17[22], 2020; and UNEP/MED WG.482/18[23], 2020), as well as the Monitoring Guideline for Analytical Quality Assurance (UNEP/MED WG.492/7, 2021) and Reporting Monitoring Data (UNEP/MED WG.492/7, 2021).

35. Only 10 laboratories from 7 countries reported information on their status regarding seafood monitoring.

36. Laboratory 3, 4 and 5 are receiving samples by a sanitary inspector due to health safety regulations, therefore the lab cannot control sampling conditions. No information is provided on the seafood species or tissues analyzed.

37. Laboratory 3 is performing trace metal analysis with GF-AAS, which is in line with the IMAP relevant Guidelines. No organic contaminants are analyzed in seafood.

38. Samples analyzed in laboratories 4 and 5 include fish and shellfish from the environment and from aquaculture. Metals are analyzed using GF-AAS, CV-AAS and Solid Hg Analyzer, while PAHs are analyzed with HPLC. All analytical methods are in line with the methods included in the IMAP relevant Guidelines. QA includes the use of CRMs and participation in PTs with good performance.

39. All procedures followed by laboratories 16 and 18 are according to IMAP relevant guidelines.

40. Laboratory 20 is analyzing bivalves from aquaculture as part of seafood monitoring. A care is taken to avoid cross contamination and samples are microwave digested with nitric acid, in line with

[22] UNEP/MED WG.482/17, 2020, Monitoring Guidelines/Protocols for Sampling and Sample Preservation of Sea Food for IMAP Common Indicator 20: Heavy and Trace Elements and Organic Contaminants.
[23] UNEP/MED WG.482/18, 2020, Monitoring Guidelines/Protocols for Sample Preparation and Analysis of Sea Food for IMAP Common Indicator 20: Heavy and Trace Elements and Organic Contaminants

IMAP relevant Monitoring Guidelines. Metal analysis is done with AAS, GF-AAS, CV-AAS, AMA, in line with IMAP Guidelines, as well as with ICP-OES, while PAHs are analyzed with GC-MS in line with IMAP Monitoring Guidelines. The laboratory is using CRMs and participates in PTs with good performance.

41. *Mullus barbatus* samples are analyzed by laboratories 24 and 25. The analytical protocols are the same as for biota analysis for CI17, therefore they are in line with requirements of IMAP Guidelines related to seafood analysis. However, the appropriate sampling protocols for seafood have to be harmonized with the procedure recommended in IMAP relevant Guidelines.

42. Laboratory 26 is participating in seafood analysis, but no information is provided on species collected, sampling procedures or samples handling. Tissues are digested in line with relevant IMAP Guidelines. Metal analysis is done with ICP-MS and therefore in line with IMAP Guidelines. PAHs are analyzed with HPLC-UVF that is in line with IMAP relevant Guidelines.

43. Laboratory 35 is analyzing fish muscle, bivalve whole body, cephalopods without viscera and crustaceans' white meat for Cd, Hg and Pb, using ICP-MS and CV-AAS, in line with the relevant IMAP Monitoring Guidelines/Protocols. The same species are analyzed for non-dioxin like PCBs (PCB 21, PCB 52, PCB 101, PCB 153, PCB 158 and PCB 180), using GC-MS and GC-MS/MS in line with IMAP relevant Guidelines. The laboratory is working on method validation for PAHs (Benzo(a)pyrene, benz(a)anthracene, benzo(b)fluoranthene and chrysene) using HPLC-UVF, in line with IMAP Guidelines. No information is provided on the sampling and sample pre-treatment procedures, although tissues microwave digestion is done using nitric acid in line with IMAP relevant Guidelines.

44. Concerning QA, most laboratories report the use of CRMs and participation in PTs, some of them specifically referred to the PTs organized by IAEA/MESL in collaboration with MEDPOL for CI17 in biota matrix.

45. In summary, while not many laboratories provided information about their seafood monitoring for heavy metals and organic contaminants most of them appear to be well-organized and in general complying with the IMAP Monitoring Guidelines. Most laboratories that replied to the CI20 questionnaire are the same as those in charge for biota matrix of CI17; only one laboratory was in charge for CI20.

Table 1: Capacity assessment scoring explanation related to CIs 13 and 14

SEAWATER	Score		
	1	0.5	0
Sampling	Lab is performing sampling		No info provided
Methods	Lab is using Suggested in guidelines Methods (SM)	Lab is using other than suggested in guidelines methods (not from list, NFL)	No info provided
Quality assurance (QA)	Accreditation/ use of CRMs / PTs for all parameters	Accreditation/use of CRMs / PTs for some parameters	No information is provided
Reporting to IMAP	Yes		No

Table 2: Assessment of the national laboratories` capacity to monitor IMAP CIs 13 and CI 14

Laboratory	**1**	**3**	**4**	**5**	**7**	**30**	**31**	**10**	**11**	**11b**	**32**	**14**	**28**	**29b**	**17**	**19**	**20**	**33**	**34**	**23**	**24**	**25**
Sampling	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1
Methods																						
Temperature	0.5	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0
Salinity	0.5	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0
Conductivity	0.5	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	0
Dissolved Oxygen	0.5	1	1	1	1	0	0.5	0.5	0.5	0.5	0.5	1	1	1	1	1	1	1	1	0	1	0
Oxygen Saturation	0	1	1	1	1	0	0.5	0.5	0.5	0.5	0.5	1	1	1	1	1	1	1	1	0	1	0
pH	1	1	1	1	1	0	1	1	0.5	0.5	0.5	1	1	1	1	1	1	1	1	0	1	0
Transparency - Secchi disk	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0
Chlorophyll *a*	0.5	1	1	1	1	0	1	1	0.5	0.5	0.5	1	1	1	1	1	1	1	1	0	1	0
Ammonium	0.5	1	1	1	1	1	1	1	1	1	0.5	1	1	1	1	1	1	1	1	0	1	0
Nitrite	0.5	1	1	1	1	1	1	1	1	1	0.5	1	1	1	1	1	1	1	1	0	1	0
Nitrate	0.5	1	1	1	1	1	1	1	1	1	0.5	1	1	1	1	1	1	1	1	0	1	0
Total Nitrogen	0	0	1	1	1	1	1	1	1	0.5	0.5	1	1	1	1	1	0	1	1	0	1	0
Orthophosphate	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0
Total Phosphorous	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0
Orthosilicate	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0
QA	1	1	1	1	1	0.5	0.5	0.5	1	0.5	0.5	0	0	0.5	0.5	0.5	1	1	0	0	1	1
Reporting to IMAP	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1

Table 3: Capacity assessment scoring explanation related to IMAP CI 17

SEDIMENTS	**BIOTA**	**SEAWATER**	**Score**		
			1	**0.5**	**0**
Sampling			Lab is performing sampling	***Biota*** Samples are delivered to lab, or only only bivalves or fish is sampled	No information provided, not sampled
Sample preparation					
Sample preparation to avoid contamination - sieving	Sample preparation to avoid contamination	Sample preparation to avoid contamination	***Sediment*** is handled to avoid contamination and are sieved ***Biota*** is handled and dissected to avoid contamination ***Seawater*** is handled to avoid contamination	***Bulk sediments*** are used (no sieving) ***Biota*** no details on handling provided	***All matrices*** No information is provided
Trace Element (TE) Digestion and Analysis					
Digestion			Sediments: strong acids +HF Biota: strong acids	Sediment: Acids but no HF	No information is provided
Analysis			TE analysis performed		No TE analysis
Cd			analysed		not analysed
Hg			analysed		not analysed
Pb			analysed		not analysed
Organic Contaminant (OC) **Digestion and Analysis**					
Extraction - cleanup			Extraction and cleanup information	Extraction information	No information is provided
Analysis			OC analysis performed		No OC analysis
PCB			Yes		No
HCB			Yes		No
Lindane			Yes		No
ΣDDTs			Yes		No
PAH			Yes		No
QA			Accreditation/ use of CRMs / participation in PTs for all contaminants	Accreditation/ use of CRMs / participation in PTs for some contaminants	No information is provided
Reporting to IMAP			**Yes**		**No**

Table 4: Assessment of the national laboratories` capacity to monitor parameters related to IMAP CI 17 in biota matrix

Laboratory	**1**	**3**	**4**	**4**	**5**	**26**	**7**	**8**	**9**	**10**	**27**	**14**	**28**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Sampling	1	0.5	0	0	1	0	0.5	1	0	0.5	0.5	1	1	1	1	1	1	0.5	0.5	1	0	0.5	0.5
Sampling preparation	0	0		0	1	0	1	1	1	0.5	1	1	0	1	1	0	0	1	0	1	0	1	1
TE																							
Digestion	0	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1
Analysis	0	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1
Cd	0	1	1	1	1	1	1	1	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1
Hg	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
Pb	0	1	1	1	1	1	1	1	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1
OC																							
Extraction - cleanup	1	0	0.5	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
Analysis	0.5	0	1	1	1	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
PCB	1	0	1	1	0	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	0	1
HCB	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0
Lindane	1	0	1	1	0	0	0	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	1
ΣDDTs	0.5	0	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1
PAH	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1
QA	0.5	1	1	1	1	1	0.5	0.5	1	1	1	1	0.5	1	1	0.5	0	1	1	1	0.5	1	1
Reporting to IMAP	0	1	1	1	1	0	1	1	1	1	0	0	1	0	0	0	0	1	1	1	1	1	1

Table 5: Assessment of the national laboratories` capacity to monitor parameters related to CI 17 in sediment matrix

Laboratory	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Sampling	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1
Sampling preparation - sieving	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0.5	0.5	0.5	0.5	1	1	1	0	1	1
TE																									
Digestion	0	1	1	1	1	0.5	1	1	0.5	0.5	0.5	0	0.5	1	0.5	0	0.5	0.5	0.5	1	0.5	1	1	1	1
Analysis	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1
Cd	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1
Hg	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	0	1
Pb	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1
OC																									
Extraction - cleanup	1	1	0	1	0	0.5	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
Analysis	1	1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
PCB	1	1	0	1	0	0	0	1	1	1	0	1	0	1	1	1	0	1	1	1	1	1	1	0	1
HCB	0	1	0	1	0	0	0	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	0	0	0
Lindane	1	1	0	1	0	0	0	1	1	1	1	0	1	0	1	0	1	1	1	1	1	1	1	0	1
ΣDDTs	0.5	0	0	1	0	0	0	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	0	0	1
PAH	0	1	0	1	0	1	0	1	1	1	1	0	1	1	1	0	1	1	1	1	0	1	1	0	0
QA	0.5	1	0.5	1	0.5	0.5	1	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5	1	1	1	1	1	1	0.5	1
Reporting to IMAP	0	1	0	1	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1

Table 6: Assessment of the national laboratories` capacity to monitor parameters related to IMAP CI 17 in seawater matrix

Laboratory	**3**	**4**	**6**	**7**	**8**	**9**	**10**	**11**	**11b**	**14**	**28**	**29**	**17**	**18**	**19**	**20**	**21**
Sampling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Sampling preparation	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
TE																	
Digestion	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Analysis	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
Cd	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1
Hg	1	0	1	0	1	1	1	0	1	1	1	1	0	1	1	1	1
Pb	1	0	1	1	1	1	1	0	1	1	1	0	1	0	1	1	1
OC																	
Extraction - cleanup	1	1	0	1	1	1	1	1	1	0.5	0.5	1	1	0	1	1	0
Analysis	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Chlorinated compounds	1	1	0	1	1	1	1	1	0	1	0	1	1	1	1	1	1
PAHs	1	1	0	1	1	1	0	1	0	1	1	1	0	0	0	0	0
QA	0.5	0	0.5	0.5	0	0	1	0	1	1	0.5	0.5	1	0.5	1	1	0.5
Reporting to IMAP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Annex II
References

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