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Marseille, France, 19-21 October 2016

Agenda item 3: Implementation of the Integrated Monitoring and Assessment Programme

Status of the IMAP Implementation with regards to Pollution and Eutrophication

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1. Introduction

1. According to Article 12 of the Barcelona Convention all Contracting Parties shall establish pollution monitoring programmes and designate the competent authorities responsible for pollution monitoring. In addition, Article 8 of the Land-Based Sources Protocol stipulates that these monitoring programmes should aim:

- a) to systematically assess, as far as possible, the levels of pollution along the Contracting Parties coasts, in particular with regard to the sectors of activity and categories of substances listed in Annex I, and periodically to provide information in this respect; and
- b) to evaluate the effectiveness of action plans, programmes and measures implemented under this Protocol to eliminate to the fullest possible extent pollution of the marine environment.

2. Since 2006, the monitoring and assessment component of the MED POL Programme has been in its Phase IV with the general objectives relevant to monitoring:

- a) to assess pollution loads from all point and diffuse sources and load of pollution reaching the Mediterranean,
- b) to assess the status and trends in the quality of the marine and coastal environment as an early warning system for potential environmental problems caused by pollution and other anthropogenic pressures;
- c) to control land-based pollution by means of compliance to national/international regulatory limits (monitoring of the implementation of the action plans, programmes and measures for the control of pollution and assess their effectiveness); and
- d) to contribute, in cooperation with other MAP components, to the application of the Ecosystem Approach to the management of human activities within MAP, with MED POL as the monitoring and assessment component.

3. The 19th Meeting of Contracting Parties (COP 19) agreed on the Integrated Monitoring and Assessment Programme (IMAP) of the Mediterranean Sea and Coast and Related Assessment Criteria which set in its Decision IG. 22/7 a specific list of 27 good environmental status common and candidate indicators and targets and principles of an integrated Mediterranean Monitoring and Assessment Programme. The IMAP aims at facilitating the implementation of article 12 of the Barcelona Convention and several monitoring related provisions under different protocols with the main objective to assess GES. Of these 27 indicators, twelve are related to pollution including two for Eutrophication (EO 5), five for Contaminants (EO9), two common and one candidate indicator for Marine Litter (EO10) and two candidate indicators for Underwater Noise (EO11).

4. There is a need to align the current MED POL monitoring as part of IMAP, during the current biennium (2016-2017), therefore a revised MED POL monitoring programme will be developed, building upon Phase IV, and with revised data, meta-data and assessment templates for the seven common indicators for contaminants and eutrophication. The structure of the MED POL monitoring activities for contaminants and eutrophication provides the starting point for IMAP EO 9 and 5, respectively, building upon long term records since 1999. Regarding Marine Litter (to be fully discussed during the CORMON meeting for Marine Litter in February 2017), Decision IG.20/10¹ adopted baseline values for Marine Litter. This revised MED POL monitoring programme will be developed for consideration by the MED POL Focal Points (May 2017). In terms of data management INFO/RAC will develop an online IMAP data platform, building upon the current MED POL online data platform developed in 2012.

5. This document provides updated information on the current MEDPOL monitoring database with regards to eutrophication and pollution, quality assurance for 2015, as well as the

¹UNEP(DEPI)/MED IG 20/8. Decision IG.20/10 Adoption of the Strategic Framework for Marine Litter management. COP 17, Paris, 2012.

INFO/RAC's progress towards establishing an Information system for IMAP data and reporting. An additional CORMON meeting is planned for February 2017 to discuss Ecological Object 10 (Marine Litter).

2. Status of monitoring implementation (pollution and eutrophication)

2.1. Marine Monitoring and Data Collection

2.1.1. Status of provision of MEDPOL monitoring database

6. Annex 1 presents the current status of data submissions to the Secretariat. For the previous biennium (2014-2015) data submissions were received from Cyprus (2012), Bosnia & Herzegovina (2006, 2007 and 2008), Egypt (2012), Montenegro (2008), France (2012), Israel (2012 and 2013), Turkey (2013), Spain (2010 and 2011), Slovenia (2013), Algeria (2012), Morocco (2011 and 2012), Tunisia (2013). For the current biennium (2015-2016), as of the 1st September 2016, data submissions have been received by Croatia (2011-2014), Cyprus (2013, 2014 and 2015), Slovenia (2014 and 2015) and Tunisia (printed report only for 2014). Figure 1.1 below shows the current MED POL stations within the MED POL Phase IV Monitoring Programme.

7. All data has been included in the MED POL database with the exception of Algeria (2012), Egypt (2012), Morocco (2009, 2011 and 2012) and Tunisia (2013) which presented some issues in terms of reporting which will need further clarifications from the respective countries (see Annex 1, highlighted).

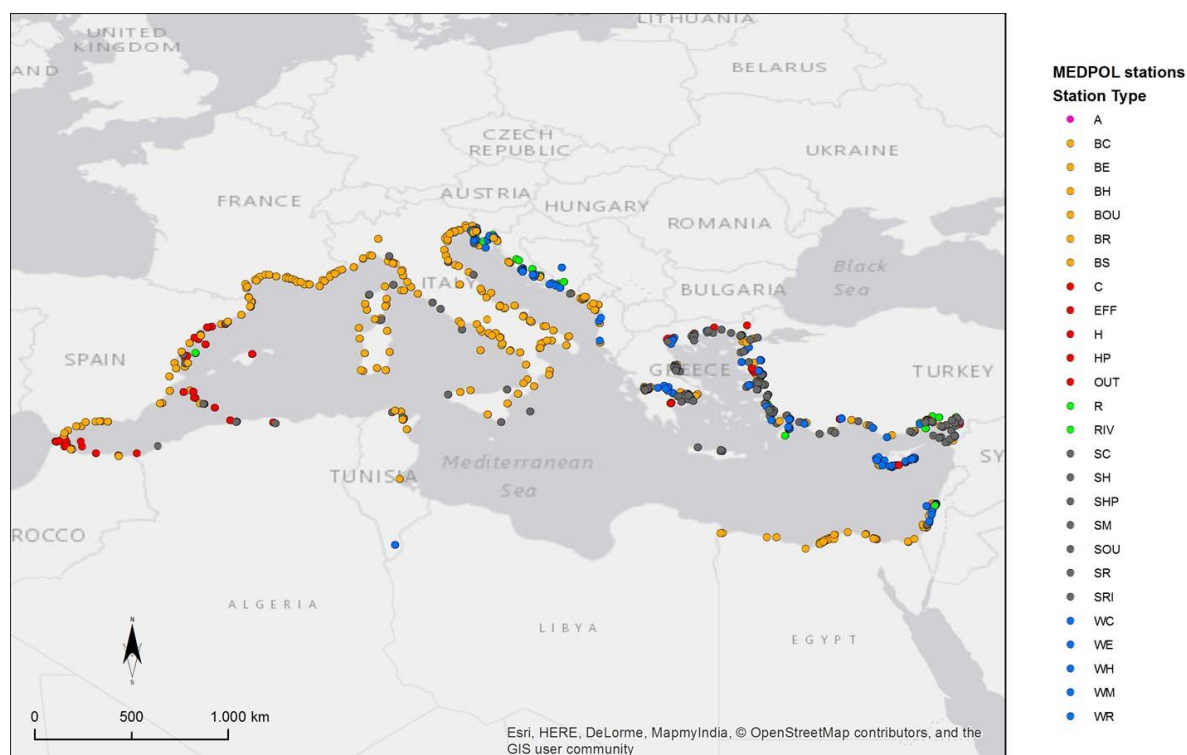


Figure 1.1. MED POL Phase IV Monitoring Stations

8. Based on all data received up to the end of 2015, a Temporal Trends and Analysis for Chemical Contaminants report was prepared and is available as Information Document UNEP(DEPI)/MED WG.427/Inf.4.

2.2. Data Quality Assurance

2.2.1 Hazardous Chemicals (Ecological Objective 9)

9. At the earliest stages of MED POL Programme, the Quality Assurance Programme mainly consisted of workshops and ad-hoc inter-laboratory comparison exercises. However, in order to respond to increasing needs for quality assured data, covering a wider range of contaminants and matrices, a more sophisticated and comprehensive data quality assurance programme was developed in 1986 integrating inter-laboratory comparison exercises, instrument maintenance, technique development, training (encompassing measurement techniques, QA/QC, instrument maintenance) and joint monitoring exercises. This work was coordinated by the UN IAEA Environment Laboratories (former IAEA Marine Environment Laboratory, MEL) in Monaco, which in 1986 established a special section, the Marine Environmental Studies Laboratory (MESL) to act, inter alia, as a Regional Analytical Centre for UNEP/MAP - MED POL to strengthen data quality assurance in the analytical laboratories participating to the MED POL monitoring programme. Since its establishment, MESL has organized 54 training courses on trace elements and organic contaminants analysis, training more than 300 scientists from 17 Mediterranean countries. Also MESL organized 34 Proficiency Tests (PTs) for Mediterranean laboratories on the analysis of trace elements and organic contaminants in marine samples and developed and published in cooperation with other UN Agencies (UNEP, IOC-UNESCO, FAO, WHO) 56 reference methods related to sampling and analysis of contaminants for monitoring programmes.

10. The Data Quality Assurance (DQA) programme jointly organized and implemented by MED POL and IAEA/MESL provided assistance to several Mediterranean laboratories for improving the quality of their monitoring data. Data generation in the Mediterranean basin has been greatly improved in quantity and quality since the early stages of the MED POL Programme. However, it has to be recognized that the situation is still far from being considered as satisfactory, because important differences exist in data quality between different Mediterranean regions.

Participation of nominated laboratories in Proficiency Tests

11. Mediterranean laboratories are usually given about six months to complete analyses and provide results to MESL. The organic compounds encompass petroleum hydrocarbons, including notably polycyclic aromatic hydrocarbons (PAHs); polychlorinated biphenyls (PCBs); several chlorinated pesticides, especially DDT and its breakdown products, and a range of sterols on some occasions. Several metals were tested, especially mercury and cadmium, together with methyl mercury in recent studies. In the PTs organized in the last 10 years (2005-2015), the number of contacted laboratories in each PT exercise ranged between 19 and 41 per year. Laboratories' participation in PTs presented important fluctuations during the last decade (Table 2.2).

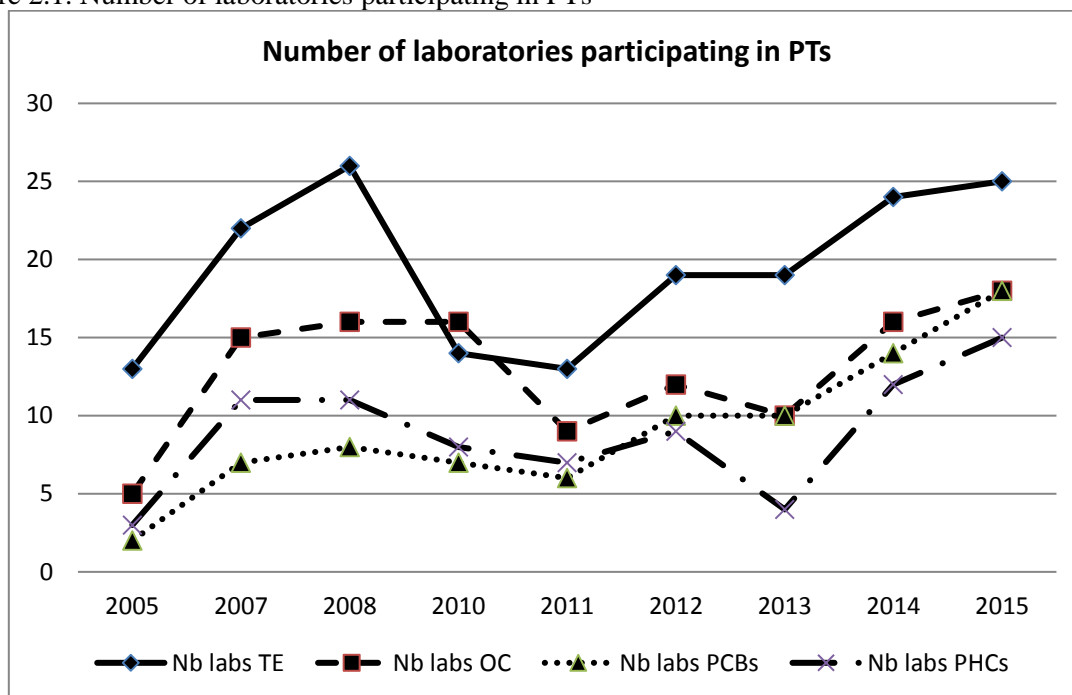
Table 2.2 Participation in Proficiency Tests (2005 – 2015)

Year	CONTACTED laboratories	PERCENTAGE of participation (%)
PTs Trace Elements	24 - 36	54 – 78 %
PTs Chlorinated pesticides	19 - 41	25 – 64 %
PTs PCBs congeners	19 - 41	10 – 56 %
PTs Petroleum hydrocarbons	19 - 41	15 – 47 %

12. In general, participation was improved in recent years (Figure 2.1), but still remains relatively low and cannot be considered as satisfactory, especially, in the PTs for organic contaminants. Although nominated by the MED POL Focal Points, several laboratories choose not to submit results. This is a serious problem because there is no record if these laboratories have a

satisfactory performance or not in the analysis of contaminants. Some of these laboratories may participate in different Proficiency Tests organized by national or regional bodies. In this case the results of these PTs should also be communicated to the MED POL Secretariat and IAEA/MESL, in order to record the performance of the laboratories concerned. On the other hand, there is no QA/QC information for the laboratories that do not participate in any proficiency tests. The problem of the relatively low participation of laboratories in the PTs organized by MED POL and IAEA/MESL has been presented in several MED POL Focal Points meetings in recent years, but the improvement in laboratory participation was relatively small, since still almost half of the nominated laboratories do not provide results on several organic contaminants. It is important that this problem is properly addressed and solved as soon as possible in order to improve data quality assurance in the Mediterranean region.

Figure 2.1. Number of laboratories participating in PTs

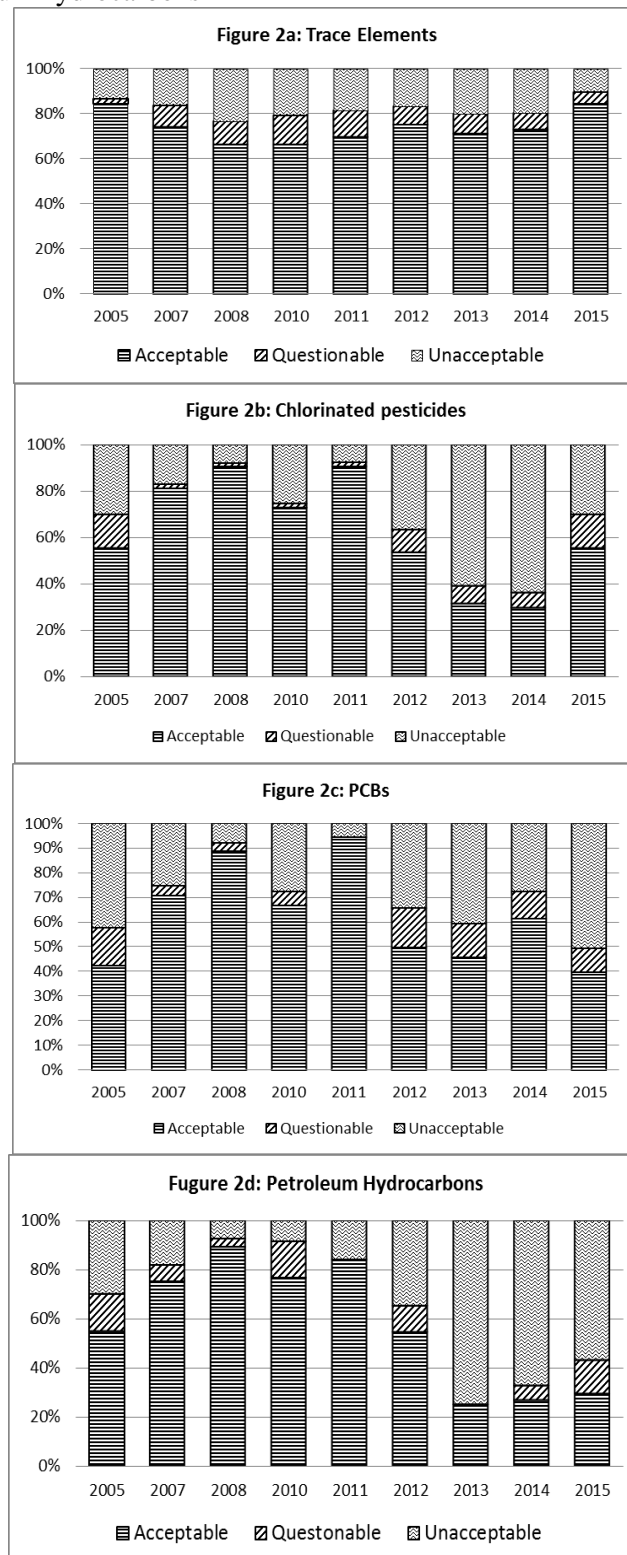


Performance of laboratories participating in Proficiency Tests

13. Performances of the laboratories participating in the Proficiency Tests vary considerably among parameters analyzed and individual laboratories. For trace elements, the acceptable results ranged between 66 and 85 % of the results submitted, while completely unsatisfactory results ranged between 10 and 23 %, which shows that there is still room for serious improvement (Figure 2.2 a).

14. The performance of laboratories on the analysis of organo-chlorinated pesticides, PCBs and petroleum hydrocarbons is less good, as it can be seen respectively in Figures 2.2 b, c and d. We can notice an important fluctuation of the results' quality between consecutive years. Furthermore, the performance results are negatively biased by the often small number of data reported from a small number of laboratories, and therefore cannot be used as a conclusive proof of general underperformance of the laboratories in the Mediterranean region. However, these results are an alarm signal that a more comprehensive assessment of the laboratories performance, especially for organic contaminants analysis, is needed in the region and that more attention should be given to the improvement of performance of non-performing laboratories.

Figure 2.2. Performance of laboratories in PTs on a) Trace Elements, b) Organochlorinated pesticides, c) PCBs, and d) Petroleum hydrocarbons



Follow-up measures for non-performing laboratories

15. Proficiency Tests provide information on the performance of laboratories in the analysis of contaminants, indicating issues that need to be taken into consideration in order to improve

performance, if necessary. Therefore, laboratories (especially non-performing laboratories) should use the results of the Proficiency Tests for identifying the causes of non-performance in view of correcting them. If no follow-up measures are taken in non-performing laboratories, no improvement of data quality could be expected. The trends in analytical performance of the MED POL related Mediterranean laboratories do not show consistent improvement over time. During the last decade (2005-2015) the results on trace elements indicate a fluctuation of acceptable results between 66 and 85 % of the results, while the percentage of acceptable results for organic contaminants was much lower. However, there are no records available on the actions undertaken in laboratories to improve performance as a follow-up of the Proficiency Tests. Laboratories that face data quality problems but are not in the position to resolve them internally should be encouraged to request external assistance for the identification and solution of potential causes of non-performance. It is important to underline that good quality of data can only be achieved if the laboratory is strongly dedicated to improving its performance, as a continuous process. This requires a close collaboration between the Secretariat, the MED POL Focal Points, the national laboratories and IAEA/MESL.

Nomination of candidates for the Training Courses

16. Every year the MED POL Programme requests MED POL Focal Points to nominate candidates for the two training courses (trace elements and organic contaminants), which are organized at the MESL in Monaco. Because of the available budget for this activity, as well as space restrictions in the laboratory, 6 trainees are accepted in each training course. It is therefore necessary to make a selection between the nominated candidates based on the needs of each laboratory/country, trying to assist as many countries as possible. It is important to underline that the training courses are addressed to analysts that are actively participating in the analysis of contaminants for the implementation of the marine pollution programme of the country in the framework of MED POL. Therefore it is important that the nominated candidates are not only actually working in the laboratory but that they will continue to do so for some years. It would be pointless to train staff, who are not working in the laboratories or are expected to be transferred to other positions in short time. Furthermore, since it is not possible to have the training courses in two languages, the nominated candidates should be able to communicate in English. Also they should have some experience on the analytical techniques used for the analysis of trace elements (i.e. Atomic Absorption Spectroscopy) and organic contaminants (Gas Chromatography) respectively. These limitations should be taken into consideration by the MED POL Focal Points when they are nominating candidates for training, in order to achieve the maximum benefit for the country and the MED POL programme.

2.2.2. Biomarkers (Ecological Objective 9)

17. A training was undertaken on biomarker analysis for the evaluation of the biological effects of toxic chemicals present in the marine environment in Alessandria, Italy from 14 to 18 December 2015 organized by Dipartimento di Scienze e Innovazione Tecnologica (DISIT), University of Piemonte Orientale, Italy.

18. This Reference Centre for the MED POL Biomonitoring programme organized the participation of 8 participants from Morocco, Tunisia, Egypt, Greece, Slovenia, Croatia and 2 from Turkey. The aim of the course was to conduct training for the analysis of the selected biomarkers with practical exercises and to provide them with standardized protocols for biomarkers analysis, including the sampling standard procedures. Furthermore, all the participants received a set of blind samples to be analyzed in their laboratories by the end of the course, in order to perform and intercalibration exercise.

19. Following adoption of the IMAP decision IG 22/7, for the first time in 2015 a biomarker (i.e. Lysosomal Membrane Stability, LMS) was obligatory for all the Countries that participated in the Programme. In addition, Micronuclei frequency (a biomarker of genotoxicity) and Acetylcholinesterase activity (a biomarker of neurotoxicity) were selected to be used in the

biomonitoring activity by different laboratories. The results of the inter-comparison exercise are still pending and therefore, these are not included in this report.

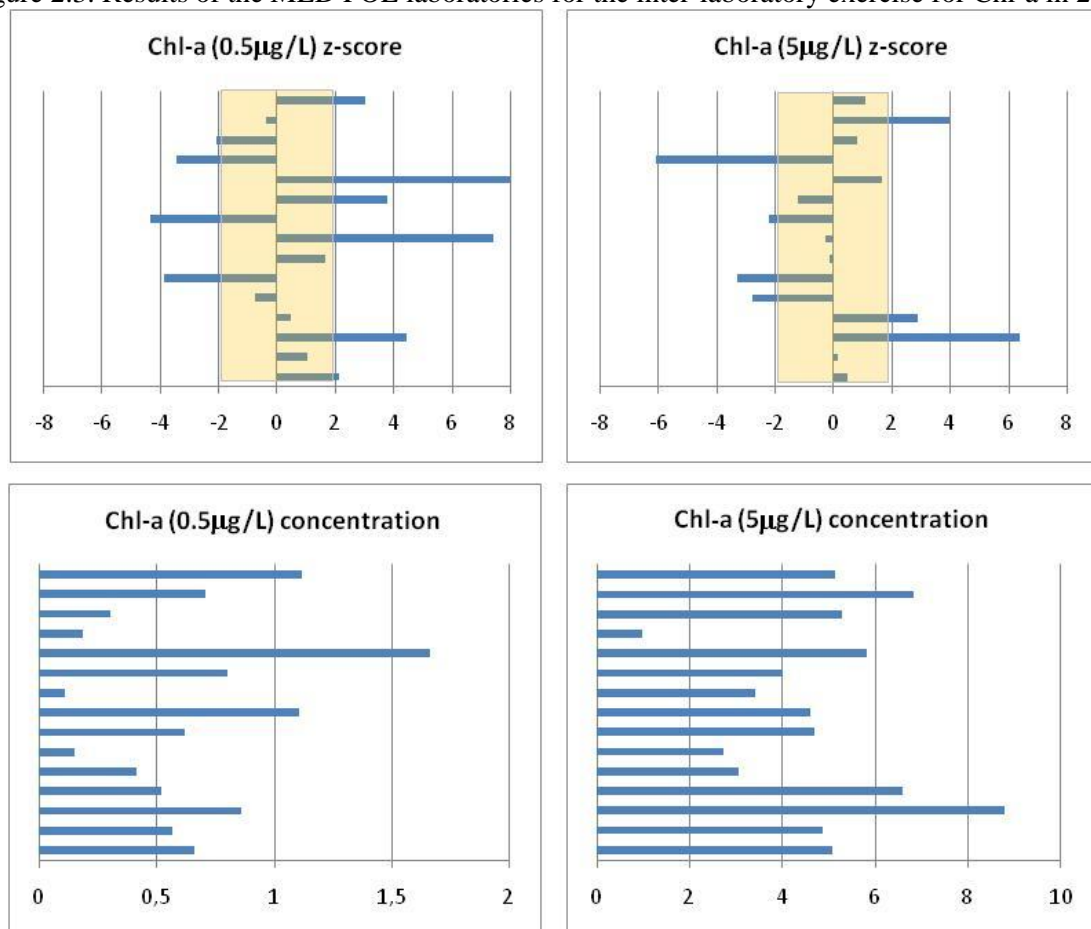
2.2.3. Eutrophication (Ecological Objective 5)

20. In 2015, inter-laboratory comparison exercises for eutrophication indicators were carried out again. The MED POL Focal Points nominated up to 16 laboratories from 8 countries (Spain, Turkey, Croatia, Slovenia, Cyprus, Israel, Greece, Morocco and Tunisia) which participated in the exercises for Chlorophyll-a and nutrients (AQ-1, AQ-2, AQ-11, see below) organized by QUASIMEME (Quality Assurance of Information for Marine Environmental Monitoring (QUASIMEME), Netherlands). The inter-laboratory exercise included the following target compounds:

- AQ-1 Nutrients in Seawater (NH₄, TO_xN, NO₂, PO₄, Silicate, Total-N, Total-P);
- AQ-2 Nutrients in Estuarine and Low Salinity Seawater (NH₄, TO_xN, NO₂, PO₄, Silicate, Total-N, Total-P) and
- AQ-11 Chlorophylls and Pheopigments in Seawater

21. In Figure 2.3 it can be observed, similarly as for chemical contaminant determinations, that a significant number of MED POL laboratories still facing analytical troubleshooting for a basic parameter such as Chlorophyll-a, and therefore indicative of the need to focus on the quality assurance within analytical laboratories. In Table 2.3 the participation of each designated laboratory within Contracting Parties are detailed.

Figure 2.3. Results of the MED POL laboratories for the inter-laboratory exercise for Chl-a in 2015.



*Z-scores between -2 and 2 are considerate as acceptable results.
Z-scores between -2 and -3, and 2 and 3 are considered as questionable results*

Table 2.3. Participation of MED POL country laboratories in the QUASIMEME interlaboratory exercises in 2015 (there are two rounds for each AQ exercise by year noted by 1 and 2).

Country	AQ-1 Nutrients in Seawater	AQ-2 Nutrients in Estuarine and Low Salinity Seawater	AQ-11 Chlorophylls and Pheopigments in Seawater
Spain-1	1,2	1,2	1
Spain-2	1,2	1,2	1,2
Turkey-1	2	2	1,2
Turkey-2	2	2	1,2
Turkey-3	1,2	1,2	1,2
Turkey-4	2	2	2
Croatia-1	1,2		1,2
Croatia-2	2		2
Slovenia-1	1,2	1,2	1,2
Slovenia-2	1,2	1,2	
Cyprus-1	1,2		1,2
Israel-1	1,2	1,2	1,2
Israel-2	1,2		1
Greece-1	1,2	1	1
Morocco-1	1,2		1
Tunisia-1	1,2	1,2	1,2

2.3. IMAP Information System

1. The MED POL on-line information system (MPIS) was firstly developed in 2007 and launched as a prototype at the MED POL FPs' meeting in 2009; testing phase and training sessions were accomplished until 2012 and user manual and video tutorial developed. In the meantime, in order to allow the Contracting Parties to report mandatory data and information, reporting formats were agreed, data checked and loaded into a Microsoft (MS) Access database managed by MED POL. Currently, the MS Access database contains the full and updated set of Contracting Parties datasets. On the other hand, MPIS is not yet used as the official reporting channel and it's partially loaded with data; moreover, the ICT used to develop the MPIS has become vulnerable, thus requiring further improvements and tests.

2. In the 2016-2017 biennium, while developing the new Data Centre of InfoMAP platform, on-line features will be added to the current data reporting, in order to ease the data management and profiled access, making use of on-line Country folders.

3. A detailed analysis will be carried on to propose a set of information standards to be used by the CPs for the collection of monitoring data related to IMAP Guidance indicators. Such set will take into account as appropriate what is already available in order to avoid reporting duplication of efforts by the Contracting Parties.

3. Final Considerations

1. Regarding the current MED POL data base, the MED POL Focal Points are encouraged to submit missing reports for the current and previous biennium, and provide information regarding any challenges or needs for additional guidance and support. Before the establishment of the CORMON, MED POL had a Monitoring Group in place with national experts responsible for the implementation of national monitoring. It is therefore recommended to build upon this experience and for MED POL Focal Points/EcAP Focal Points to consider nomination of a monitoring expert for each Ecological Objective: Eutrophication (EO5) and Contaminants (EO9). These two monitoring experts

would then attend future CORMON meetings, to ensure sustainability in terms of composition under the overall guidance of the MED POL Focal Point.

2. As presented in this and previous MED POL reports, the results of quality assurance exercises/proficiency tests for chlorophyll-a, nutrients and contaminants still indicate a high proportion of data below acceptable limits. The interlaboratory exercise results for biomarkers have not been received yet. It is therefore suggested that there is follow up between MED POL, MED POL Focal Points and the concerned laboratories to identify the problems faced, agree on solutions and ensure that future training can be targeted to support those laboratories. It is also suggested that future data submissions to the MED POL database include quality assurance data (based on the MED POL template). Additionally it is recommended that national laboratories should consider incorporating international standard methods (if available), accreditation schemes (eg. ISO 17025) and actively participate in the interlaboratory exercises (proficiency test, PTs) organized by the MED POL Programme.

Annex I
Datasets received by UNEP/MAP Secretariat by September 2016 within the MED POL
Programme with regards to Ecological Objectives 5 and 9

Datasets received by UNEP/MAP Secretariat by September 2016 within the MED POL Programme with regards to Ecological Objectives 5 and 9.

<i>Country</i>	<i>Nutrients</i>	<i>Chl-a</i>	<i>Biota - TM</i>	<i>Biota - OC</i>	<i>Sediment TM</i>	<i>Sediments OC</i>	<i>Rivers - Nutrients</i>	<i>Oceanographic parameters (Temp., etc.)</i>
Albania	2005 2006		2001 2002 2003 2004 2005 2006 2007	2003 2004				
Algeria	2012	2012	2012	2012	2012	2012		
Bosnia-Herzegovina	2006 2007 2008	2006 2007 2008					2006 2007 2008 2009 2010	
Croatia	2009 2011 2012 2013 2014	2009 2011 2012 2013 2014	2009 2011 2012 2013 2014	1999 2000 2003 2004 2005 2006 2009 2011 2012 2013 2014	2002 2003 2004 2005	2009	2000 2001 2002 2003 2004 2005 2009 2009	
Cyprus	2001 2007 2012 2013	2004 2005 2006 2007 2008 2009 2010 2012 2013	1999 2001 2005 2006 2008 2009 2010 2012 2013	2000 2001 2002 2003 2004 2008 2009 2012 2013			2001 2002 2003 2004 2005 2006 2007	

<i>Country</i>	<i>Nutrients</i>	<i>Chl-a</i>	<i>Biota - TM</i>	<i>Biota - OC</i>	<i>Sediment TM</i>	<i>Sediments OC</i>	<i>Rivers - Nutrients</i>	<i>Oceanographic parameters (Temp., etc.)</i>
	2014 2015	2014 2015	2014 2015	2014 2015				
Egypt	2009 2010 2012	2009 2010 2012	2006 2009 2010 2012	2006 2009 2010 2012	2006 2009 2010	2006 2009 2010		
France	2009 2012	2009 2012	1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2009 2012	1997 1999 2000 2001 2002 2003 2004 2005 2006 2009 2012	2006 2009 2010 2011	2006 2009 2010 2011		
Greece	1999 2000 (few) 2004 2005	1999 2000 (few) 2004 2005	1999 2004 2005	1999 2004 2005	1999 2000 (few) 2004 2005			
Israel	2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013	2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013	1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013		1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013			2003 2004 2005 2006 2007 2010 2011 2012 2013
Italy			2001 2002 2003	2001 2002 2003	2001 2002 2003	2001 2002 2003		

<i>Country</i>	<i>Nutrients</i>	<i>Chl-a</i>	<i>Biota - TM</i>	<i>Biota - OC</i>	<i>Sediment TM</i>	<i>Sediments OC</i>	<i>Rivers - Nutrients</i>	<i>Oceanographic parameters (Temp., etc.)</i>
			2004 2005 2006 2009	2004 2005 2006 2009	2004 2005 2006 2009	2004 2005 2006 2009		
Lebanon								
Libya								
Malta								
Monaco								
Montenegro	2008 2011	2008 2011	2008 2009 2010 2011	2008 2009 2010 2011	2008 2011	2008 2011		
Morocco	 2006 2007 2008		1998 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2011 2012	 2006 2007 2009 2011 2012	 2006 2007	 2006 2007		 2006 2007 2009
Slovenia	1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014	1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014	1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014	2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014		1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014	2003 2004 2005 2007 2008 2009 2010 2011 2012 2013 2014	2012

