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EVALUATION OF MED POL - PHASE II MONITORING DATA

Part I - Sources of Pollution

In collaboration with:



WORLD HEALTH ORGANIZATION

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1. INTRODUCTION

The monitoring component of the Long-term Programme of Pollution Monitoring and Research in the Mediterranean Sea (MED POL Phase II), approved by the Contracting Parties to the Convention for the Protection of the Mediterranean Sea against Pollution and its related Protocols at their Second Ordinary Meeting in Cannes in March 1981, includes the monitoring of sources of pollution to provide information on the type and amount of pollutants reaching the marine environment from coastal sources.

In the selection of sources of pollutants to be monitored within the framework of national MED POL monitoring programmes by agreements signed between the Coordinating Unit for the Mediterranean Action Plan on the one hand, and by the relevant country Authorities on the other (normally by the national MED POL Coordinator on their behalf), the identification of sources includes all discharges of pollutants from land-based sources, in particular from outfalls discharging into the sea or through coastal disposal and from fixed man-made offshore structures which are under national jurisdiction and which serve purposes other than exploration and exploitation of mineral resources of the continental shelf and the seabed and its sub-soil, through authorisations granted. More specifically, apart from wastes dumped under special and general permits, the sources to be monitored include (1) effluents of specified industries, and (2) outlets of specified urban agglomerations. The selection of sites is decided on by the national authorities of the countries concerned.

The parameters to be determined in effluents (as and where appropriate) as decided on by the Contracting Parties' Cannes meeting in 1981, were the following:

Priority parameters

- Total mercury (Hg)
- Total cadmium (Cd)
- Petroleum hydrocarbons (PH)

Other parameters (not in order of priority)

- High molecular weight chlorinated hydrocarbons (HH)
- Biochemical oxygen demand (BOD₅)
- Chemical oxygen demand (COD)
- Total suspended solids (TSS)
- Total phosphorus (P)
- Total nitrogen (N)
- Faecal coliforms (FC)
- Detergents (anionic) (DET)
- Phenols (index) (PHE)
- Total lead (Pb)
- Total chromium (Cr)
- Total zinc (Zn)
- Selected radionuclides (RAD)

National monitoring agreements also specify that:

- (a) Sources identified will be sampled according to a schedule established after carrying out a study of the production cycle of each pollutant;

- (b) In sampling and analysis, the reference methods provided by the Coordinating Unit for the Mediterranean Action Plan shall be followed;
- (c) Data from the monitoring of effluents shall be reported as soon as available, and reports assessing the overall amounts of pollutants discharged during corresponding periods (annually) by each country shall be submitted before the end of each calendar year.

Following a small ad hoc Consultation to review the MED POL monitoring component, the Working Group on Scientific and Technical Cooperation for MED POL, at their fifth meeting (Athens, 6-10 April 1987) agreed on a revised set of parameters to be monitored for effluents, which were divided into two categories, the first to be included in national MED POL monitoring programmes, and the second to be included in both MED POL and other national monitoring programmes whenever necessary and applicable. The parameters recommended were as follows:

Category I parameters

- Volume and characteristics of discharge (e.g. pH, temperature, general composition)
- Total mercury
- Total cadmium
- Total suspended solids
- Total phosphorus
- Total nitrogen
- Faecal coliforms
- BOD/COD
- High molecular weight halogenated hydrocarbons

Category II parameters

- Petroleum hydrocarbons
- Detergents
- Phenols
- Total chromium
- Selected radionuclides
- Other pollutants known to be discharged in significant quantities

It was also recommended by the Working Group that, for obvious reasons, in the specific case of industrial effluents, the parameters listed above, and/or other parameters, should be selected in accordance with the specific composition of the wastewater discharged.

These recommendations as outlined above were approved by the Contracting Parties at their Fifth Ordinary Meeting in Athens in September 1987. The pollution source component of MED POL monitoring programmes would therefore have to reflect these revised parameters as from 1988.

2. PRESENT STATE OF POLLUTION SOURCE MONITORING WITHIN THE FRAMEWORK OF MED POL PHASE II

The following eleven countries have formally signed MED POL monitoring agreements with the Coordinating Unit for the Mediterranean Action Plan:

- | | |
|-----------|--------------|
| - Algeria | - Libya |
| - Cyprus | - Malta |
| - Egypt | - Morocco |
| - Greece | - Syria |
| - Israel | - Yugoslavia |
| - Lebanon | |

Of these countries, nine (all except Israel and Lebanon) have included pollution source monitoring within the framework of their national programmes. On the basis of the agreements signed, the scope and extent of such monitoring can be summarised as follows:

3. OUTLINE DESCRIPTION OF POLLUTION SOURCE MONITORING WITHIN THE FRAMEWORK OF MED POL

The following is an outline description of the scope of pollution source monitoring currently operational within the framework of the MED POL Phase II programme in terms of relevant agreements signed.

- Algeria

Municipal effluents : 3 sampling stations
Industrial effluents : 5 sampling stations
Parameters covered : BOD, COD, TSS, N, P, Hg, Cr
No. of Institutions : 2

- Cyprus

Municipal effluents : Nil
Industrial effluents : 14 sampling stations
Parameters covered : BOD, COD, TSS, N, P, PH, Cd, Pb, Cr, Zn, Cu, HH
No. of Institutions : 1

- Egypt

Municipal effluents : 5 sampling stations
Industrial effluents : 4 sampling stations
Parameters covered : BOD, COD, TSS, N, P, FC, DET, PHE, PH, Hg, Cd, Pb, Cr, Zn, HH, RAD
No. of Institutions : 3

- Greece

Municipal effluents : 4 sampling stations
Industrial effluents : 7 sampling stations
Parameters covered : BOD, COD, TSS, N, P, FC, DET, PHE, PH, Hg, Cd, Pb, Cr, Zn, HH, RAD
No. of Institutions : 5

- Libya

Municipal effluents : 4 sampling stations
 Industrial effluents : 7 sampling stations
 Parameters covered : BOD, COD, TSS, N, P, FC, DET, PH, Hg, Cd, Pb, Cr, Zn
 No. of Institutions : 3

- Malta

Municipal effluents : 4 sampling stations
 Industrial effluents : Nil
 Parameters covered : BOD, COD, TSS, N, P, FC, DET, Hg, Cd, Pb, Cr, Zn, HH, Cu, Fe, Ni, Mn, Co
 No. of Institutions : 3

- Morocco

Municipal effluents : 18 sampling stations
 Industrial effluents : 11 sampling stations
 Parameters covered : BOD, COD, TSS, N, P, FC, DET, PHE, PH, Hg, Cd, Pb, Cr, Zn, HH
 No. of Institutions : 4

- Syria

Municipal effluents : 9 sampling stations
 Industrial effluents : 5 sampling stations
 Parameters covered : BOD, COD, TSS, N, P, FC, DET, PHE, PH, Hg, Cd, Pb, Cr, Zn, Cu, RAD
 No. of Institutions : 3

- Turkey (not yet operational)

Municipal effluents : 7 sampling stations
 Industrial effluents : 6 sampling stations
 Parameters covered : BOD, COD, TSS, N, P, FC, PH, Hg, Cd
 No. of Institutions : 2

- Yugoslavia

Municipal effluents : 25 sampling stations
 Industrial effluents : 15 sampling stations
 Parameters covered : BOD, COD, TSS, N, P, FC, DET, PHE, PH, Hg, Cd, Pb, Cr, Zn, HH, RAD
 No. of Institutions : 9

In a number of national programmes, there is a certain degree of overlap between municipal and industrial sources, the latter sometimes being also included within the former. Moreover, practically all municipal sources are in fact mixed, including effluents of industries discharged into the municipal sewage system.

So far, actual results have been reported from five countries, as follows:

- Algeria : 1987
- Cyprus : 1983 - 1987
- Malta : 1983 - 1988
- Morocco : 1983 - 1987
- Yugoslavia : 1983 - 1987

In Morocco, apart from the "regular" programme, a comprehensive study on levels of organochlorine pesticides in various matrices was carried out in 1984 and 1985. This programme included sampling from 9 municipal and industrial effluents.

A total of 9996 samples have been reported as analysed so far. These are listed for each parameter by year in Table I and by country in Table II. Data for 1988 only cover all the priority parameters, as well as optional ones, with the exception of selected radionuclides, for which no data have been reported so far.

As expected, there is a wide variation in the levels of the various parameters analysed between the various stations. Apart from the "natural" variation between stations monitoring effluents of different composition, there is also quite a variation between stations monitoring effluents from sources of a similar type. While the data obtained can form the starting point towards estimating the pollutant input into the Mediterranean per source monitored, it is considered premature to attempt to perform an overall technical evaluation leading to a general picture, in spite of the apparently large number of measurements.

The data so far received represent the situation in specific areas of only five Mediterranean countries out of 18. Of these five, two (Cyprus and Malta) are small. In the four countries submitting their reports over a relatively long period of time (5-6 years) no definite trends could be established from the data reported for the various stations which had been monitored throughout (particularly the 1984-1987 period). While the information and data being collected are therefore useful, these will eventually have to be supplemented by more from other countries in order to provide a better picture of the overall situation in the region as a whole. Furthermore, the general approach to pollution source monitoring, which represents a relatively recent venture in the marine pollution monitoring field for a number of countries, requires standardisation.

A consultation meeting on monitoring of land-based sources of marine pollution in the Mediterranean was jointly convened by WHO and UNEP in Split from 1 to 5 December 1987. This meeting agreed on the elements of a general approach to the monitoring of land-based pollution sources in relation to preventive and remedial action. In defining land-based pollution sources, the meeting considered the terms of article 4 of the Protocol for the protection of the Mediterranean Sea against pollution from land-based sources, which lays down that the protocol currently applies to polluting discharges reaching the protocol area from land-based sources within the territories of the parties, in particular directly from outfalls discharging into the sea or through coastal disposal, and indirectly through rivers, canals or other watercourses, including underground watercourses, or through run-off. The same article also included pollution from land-based sources transported by the atmosphere, but this aspect was conditional to the development of an additional annex to the protocol. In accordance with current interpretation of the terms of the protocol by the Working Group on Scientific and Technical Cooperation (WGSTC)

Table I

Number of effluent samples taken and measured for each parameter by year

<u>Parameter</u>	<u>Number of samples</u>						<u>Total</u>
	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988*</u>	
Hg	13	160	154	170	168	0	665
Cd	17	159	154	119	121	20	590
TSS	54	197	246	215	224	20	956
P	61	197	256	236	238	20	1008
N	64	193	247	238	240	20	1002
FC	6	135	161	126	117	0	545
BOD	61	208	177	216	198	20	880
COD	57	173	225	192	195	20	862
HH	0	66	106	12	15	12	211
PH	48	48	84	93	88	0	361
DET	12	133	133	160	144	12	594
PHE	0	54	109	121	107	0	391
Cr	17	66	72	90	95	20	340
Pb	17	123	100	119	89	20	468
Zn	16	119	138	71	100	20	444
Cu	6	32	50	21	23	20	152
As	0	0	0	0	8	0	8
Fe	6	31	32	21	23	20	133
Ni	6	23	32	21	20	20	122
Mn	6	23	32	21	20	20	122
Co	6	23	32	21	20	20	122
Total	473	2163	2540	2283	2233	304*	9996

* 1988 data refer only to Malta

Table II

Number of effluent samples taken and measured for each
parameter by country

<u>Parameter</u>	<u>Number of samples</u>					<u>Total</u>
	<u>ALG</u>	<u>CYP</u>	<u>MAT</u>	<u>MOR</u>	<u>YUG</u>	
Hg	4	0	108	75	478	665
Cd	3	8	128	81	370	590
TSS	0	240	133	87	496	956
P	4	240	134	169	461	1008
N	4	240	133	175	450	1002
FC	0	0	72	0	473	545
BOD	2	220	101	86	471	880
COD	0	240	134	73	415	862
HH	3	0	79	129	0	211
PH	4	240	0	0	117	361
DET	0	0	64	72	458	594
PHE	2	0	0	72	317	391
Cr	3	0	128	81	128	340
Pb	0	0	128	81	259	468
Zn	0	8	128	80	248	444
Cu	3	0	128	0	21	152
AS	0	8	0	0	0	8
Fe	3	8	122	0	0	133
Ni	0	0	122	0	0	122
Mn	0	0	122	0	0	122
Co	0	0	122	0	0	122
Total	35	1452	2086	1261	5162	9996

for MED POL, outfalls discharging directly into the sea, diffuse discharges (also directly into the sea) and estuaries were considered as sources of land-based pollution to be monitored. This of course did not preclude any country from taking any control measures considered appropriate in the case of effluents discharged into rivers.

The meeting agreed that in order to develop a common basic approach to pollution source monitoring, relevant guidelines were necessary. The outline content of such guidelines was discussed, and it was considered that these should specify the mode of approach, emphasise preventive and control measures, and stress the need for the development of appropriate national, regional and local organisation in monitoring. The guidelines would also have to identify the types of land-based sources of pollution to be monitored, explain sampling procedures (including frequency of sampling), specify the various parameters to be monitored, and define appropriate confidence limits. Furthermore, the section of the guidelines dealing with general philosophy and approach would have to include appropriate refined flow-charts clearly indicating the role of pollution source monitoring within the overall framework of marine pollution prevention and control programmes. It was also emphasised that the monitoring programme itself should have an interactive approach to enable continuous or periodical readjustment in the light of experience acquired.

The same meeting considered that the pollution load discharged into the marine environment should preferably be calculated from concentration/flow determinations. In the case of diffuse sources of pollution, three approaches were mentioned as possibilities:

- determination of the concentrations of selected pollutants in various parts of the receiving marine environment in combination with salinity measurements, extrapolating to zero salinity, and flow estimations;
- utilisation of information obtained from similar situations in which accurate load calculations were available or could be made;
- calculation of population equivalents.

In the case of sampling, the taking of composite (automatically or by hand) or random (grab) samples would depend on the particular parameter being measured. The latter method might be preferable in the case of certain parameters, such as trace metals and organics, to avoid possible contamination or change in the composition of the samples. Prior to determining the number of samples to be taken in a full period, a decision was necessary regarding the percentage reliability of results required.

One particular aspect which precludes a comparative analysis of results obtained so far is the fact that the various laboratories are utilising internationally-accepted, but different, methodologies. In this regard, the December 1987 Split meeting recognised that, to date, no standardised methodology for effluent analysis had been developed specifically for the MED POL programme. This problem, however, was more apparent than real in the sense that most of the methods developed for the programme's other components (determination of microbiological and chemical parameters in seawater, marine biota and sediments) could be applied equally well to the same parameters in effluents with only relatively minor modifications in the analytical processes themselves. The problem of sampling methodology, however, still had to be finalised, and this could be taken care of in the proposed guidelines which the meeting had discussed.

The preparation of draft guidelines for monitoring of land-based marine pollution sources was commenced in mid-1988, and the estimated date of completion is July/August 1989. The outline content is attached as Annex 1. Similarly, work has been taken in hand towards the preparation of suitable reference methods for determination of the various parameters in effluents, which will utilise the analytical content of existing reference methods for determination of the same parameters in other matrices of the marine environment to the fullest degree possible. It is expected that the first drafts of these methods, which are necessarily linked with the guidelines, will be available by 1989.

4. CONCLUSIONS

The current geographical coverage of the pollution source component of the MED POL monitoring programme is still relatively sparse.

To enable the construction and updating of a general picture of the situation in the Mediterranean as a whole, participation in this component of the programme should be extended to provide adequate geographical coverage, taking better account of the major pollution sources existing within the territories of the contracting parties. Similarly, relevant data has to be made available by countries having their own programmes independently of MED POL.

At the present time, when land-based pollution source monitoring in the Mediterranean is becoming operational, the development of a common general approach is essential. This will be reflected in the guidelines under preparation. application of the guidelines will have to be undertaken concurrently with an in-depth review of the appropriate sections of individual MED POL monitoring agreements to ensure optimum linkage of data collection with country situations and requirements.

Harmonisation of methodology should be achieved to the greatest extent possible, particularly through the eventual utilisation of standard reference methods for sampling and analysis, currently in preparation, through regular intercalibration exercises, and through meetings and workshops addressing practical technical problems.

As many as possible of the major sources of land-based pollution along the Mediterranean coastline itself, as well as along rivers discharging into the Mediterranean Sea, should be identified.

Annex 1

Draft guidelines for monitoring of land-based
marine pollution sources

1. Introduction and background.
2. Scope and objectives of the monitoring programme.
3. Philosophy and approach.
4. Collection of available information and preliminary survey.
5. Types of pollution sources:
 - 5.1 Point sources
 - outfalls (municipal, industrial, mixed)
 - rivers
 - solid waste and sludge disposal and dumping sites
 - major accidents
 - 5.2 Diffuse sources
 - small outfalls
 - run-off (continuous, discontinuous)
 - other sources contributing to airborne pollution
6. Sampling:
 - 6.1 Matrices and locations.
 - 6.2 Methodology, including types of samples (e.g. composite, grab) to be taken.
 - 6.3 Frequency.
7. Parameters:

As determined by the Working Group on Scientific and Technical Cooperation (WGSTC) for MED POL, and adopted by the Contracting Parties, but also to include flow-measurements.
8. Analytical methodology
 - Techniques
 - Intercalibration and quality control
9. Data acquisition and evaluation (the latter in terms of any practical action indicated).
10. Programme organisation (including necessary administrative structure and technical requirements).