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DRAFT GUIDELINES FOR THE ISSUE OF AUTHORIZATIONS FOR THE DISCHARGE OF LIQUID WASTES INTO THE MEDITERRANEAN

In co-operation with

WORLD HEALTH ORGANIZATION

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I INTRODUCTION AND BACKGROUND

1. Article 8 of the Convention for the Protection of the Mediterranean Sea against Pollution, adopted by the Coastal States of the Region in Barcelona on 16 February 1976 (UNEP, 1978a) states :

> "The Contracting Parties shall take all appropriate measures to prevent, abate and combat pollution of the Mediterranean Sea Area caused by discharges from rivers, coastal establishments or outfalls, or emanating from any other land-based sources within their territories".

2. Apart from adopting the Convention, the Conference of Plenipotentiaries of the Coastal States of the Mediterranean Region on the Protection of the Mediterranean Sea (Barcelona, 2-16 February 1976), in its Resolution No. 2 on Interim Arrangements, acknowledged the work undertaken by the World Health Organization for the preparation of a draft Protocol for the Protection of the Mediterranean Sea against Pollution from Land-based Sources, and called on the Executive Director of UNEP, in cooperation with the international organizations concerned, to continue the preparatory work for such a Protocol.

3. In accordance with this Resolution, and within the framework of the Co-ordinated Mediterranean Pollution Monitoring and Research Programme (MED POL Phase I) a Pilot Project on Pollutants from Land-based Sources in the Mediterranean (MED POL X) was added to the seven pilot projects originally approved by the Intergovernmental Meeting on the Protection of the Mediterranean, held in Barcelona from 28 January to 4 February 1975 (UNEP, 1975). The ultimate objective of this project was to provide Governments of the Mediterranean Coastal States, as the sole beneficiaries of the project, with appropriate information on the type and quantity of pollution inputs from major land-based sources and rivers, and on the present status of waste discharge and water pollution management practices (FAO/UNESCO/IOC/WHO/WMO/IAEA/UNEP, 1983). The pilot project was a joint undertaking contributed to by WHO, ECE, UNIDO, FAO, UNESCO and IAEA, with WHO assuming responsibility for coordination of the project, and UNEP assuming responsibility for coordinating the project activities with those either under way or planned within the framework of the Mediterranean Action Plan, and for ensuring the full participation of Mediterranean Governments in the project.

4. The project was completed in 1977 (ECE/UNIDO/FAO/UNESCO/WHO/IAEA/UNEP, 1977), its report serving as one of the background documents during negotiations by Mediterranean Governments on the draft Protocol. For the same purpose, WHO and UNEP carried out a survey of existing national legislation of Mediterranean States for the control of pollution from land-based sources (WHO/UNEP, 1976), which survey is currently being updated.

5. Following a number of intergovernmental consultations and expert meetings between 1977 and 1979, a Conference of Plenipotentiaries of the Coastal States of the Mediterranean Region for the Protection of the Mediterranean Sea against pollution from land-based sources was convened by UNEP in Athens from 12 to 17 May 1980. The Protocol for the Protection of the Mediterranean Sea against Pollution from land-based sources was adopted and singed at this Conference (UNEP, 1980) and entered into force on 17 June 1983, following the deposition of the sixth instrument of ratification.

6. Under the terms of the protocol, discharge into the Mediterranean Sea of a number of substances, families and groups of substances and sources of pollution are subject to the issue of an authorization by the competent national authorities, as defined by Article 6, and by Annexes I, II and III to the protocol, the first two annexes listing the substances and sources, the third listing the various factors to be taken into account when issuing the relevant authorizations for discharge. The scope of this document is to review the substances and sources in outline, and to propose draft guidelines for the issue of authorizations.

7. During the course of the pilot phase of MED POL, a set of principles and guidelines for the discharge of wastes into the marine environment was prepared under the joint sponsorship of WHO and UNEP, designed to assist national authorities of Mediterranean States in the implementation of the protocol, and more specificallly for the issue of authorizations (WHO/UNEP 1979). The compilation of this work was entrusted to the Institute of Sanitary Engineering of the University of Milan, while the contents of the various chapters were developed by a multidisciplinary team of experts from Mediterranean States together with WHO and UNEP Staff. This publication has been recently re-issued in a slightly modified form (WHO/UNEP 1982), and has provided the technical basis for the present document.

II THE PROBLEM OF POLLUTION IN COASTAL AREAS

8. The widespread population growth in the coastal zone of the Mediterranean, the extension of domestic liquid wastes, discharge networks and the higher standards of living, have considerably increased the amount of sewage discharge into the Mediterranean Sea. This situation has been aggravated by the continuously growing tourist population and the production of peak quantities of domestic wastes sometimes tending to a ten-fold increase of the usual flow. In addition to the actually experienced increase in the sewage load, the influx of tourists from different countries contributes to an increase in the diversity of pathogenic organisms in the sewage discharged, with resultant higher risks to public health.

9. Population increase and higher standards of living are accompanied by the extension and diversification of industry. More new substances are introduced in processes and products. New uses are found for existing materials. Many of these changes are reflected in their wastes and pose additional threats to the problem of pollution of the receiving water body. The wastes discharged into the Mediterranean continue to increase in volume and complexity, and constitute a growing problem.

10. Pollution of the Mediterranean may be caused a) directly by point discharge of sewage or industrial liquid wastes; b) by point sources discharge of solid wastes and c) by indirect not point sources discharges through agricultural run-off, river discharges and radioactive discharges. The present document deals with control of the first source, i.e. point discharges of liquid wastes.

III POLLUTION AND HARMFUL SUBSTANCES

11. According to article 2 of the Convention for the protection of the Mediterranean Sea against Pollution, marine pollution means the introduction by Man directly or indirectly, of substances or energy into the marine environment resulting in such deleterious effects as harm to living resources, hazards to human health, hindrance to marine activities including fishing, impairment of quality for use of seawater and reduction of amenities.

12. For the purposes of control, harmful substances are tentatively divided into two groups (see Annex I and Annex II of the Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based sources). The first group comprises those substances which are toxic, persistent and accumulate in living organisms. The Protocol lays down that discharge of these specific substances should be strictly regulated to prevent pollution. Authorizations for the discharge of these substances only applies when such discharges fall below the limits to be defined by the Contracting Parties.

13. The second group comprises potentially harmful substances which are, or may be, noxious according to circumstances, but whose harmfulness is reduced by dilution or natural processes, and whose scope for causing damage is limited in both space and time. Those potentially harmful substances should only be discharged in accordance with a legal authorization embodying such restrictions as are necessary to protect the quality of the receiving waters.

14. The purpose of this document is to provide assistance in formulating suitable authorizations for the discharge of potentially harmful substances. It deals with the successive steps involved in the process and is intended to assist in establishing a common and rational approach. Uniform standards for treatment are not proposed. However, a general methodology applicable to local problems producing a solution appropriate to individual circumstances is suggested. The purpose is to advise and in no way mandatory.

15. Relevant information and underlying considerations are presented in a form intended to provide guidance in the preparation of authorization for potentially harmful substances as envisaged in the protocol for the Protection of the Mediterranean Sea against pollution from Land-based sources.

IV METHODS OF CONTROL

16. Various methods have been employed to control the discharge of polluting materials into a water body. The oldest is probably that involving the imposition of identical limits to all discharges. This method is often called "uniform emission standards". It is now being superseded in some countries by control based upon reference to the environmental or ambient quality levels necessary to maintain the receiving water in a fit state for its legitimate and required uses. The relevant limits for each discharge are normally established by the controlling authority.

17. The "Uniform emission standards" system has fixed constituents and characteristics and are imposed upon all discharges irrespective of the volume and nature or of the volume and use of the receiving water. Its advantage is the ease of application. The imposition of limits and their enforcement through monitoring is administratively and technically simple. The staff required is small, has no discretionary powers and moreover, is not vulnerable to political and/or local pressures.

18. Another advantage of this method is that all discharge sources are treated equally and for industrial dischargers there is no adverse effect on commercial competitiveness arising from differences in the location of factories for the same industry.

19. The disadvantage of the method is that for the majority of discharges the fixed objective is either insufficient to prevent pollution or is too stringent and involves unnecessary treatment. Thus the objectives are either too little and ineffective or too much, involving unnecessary expenditure. Under the widely differing social, economic and industrial conditions in the various Mediterranean countries, a system of this nature is impracticable.

20. The "Environmental Quality Objectives" system is based on the philosophy of controlling discharges so that the quality of the receiving water body at any specified place is suitable for its established legitimate uses. To this end the optimum use is made of existing technical and financial resources.

21. The application of this method calls for more technical information and skill than the uniform emission standards method. The degree of precision with which the individual discharge objectives are determined will depend upon the technical facilities available. This system is a more flexible one permitting the exercise of judgement according to local conditions.

22. The procedure for the control of discharges based on environmental quality objectives is illustrated in Fig. 1.

23. The first step is to define the area in geographical terms, determining its boundaries and then to decide on the uses of the water in that area. Next, the criteria to determine the suitability of the water for the purposes for which it will be used are selected. The criteria are then used to stipulate the quality levels necessary for the defined uses. Where there is more than one use the most stringent level for each quality characteristic will be considered.

24. It is customary to employ two levels for each quality characteristic. One is the desirable level which would be accepted as satisfactory and requiring no further improvement. The other is a less stringent objective regarded as the maximum tolerable limit. If this limit is exceeded the water is unfit for the considered use. Wherever water quality is between the two levels the objective of attaining the lower level should always be maintained.

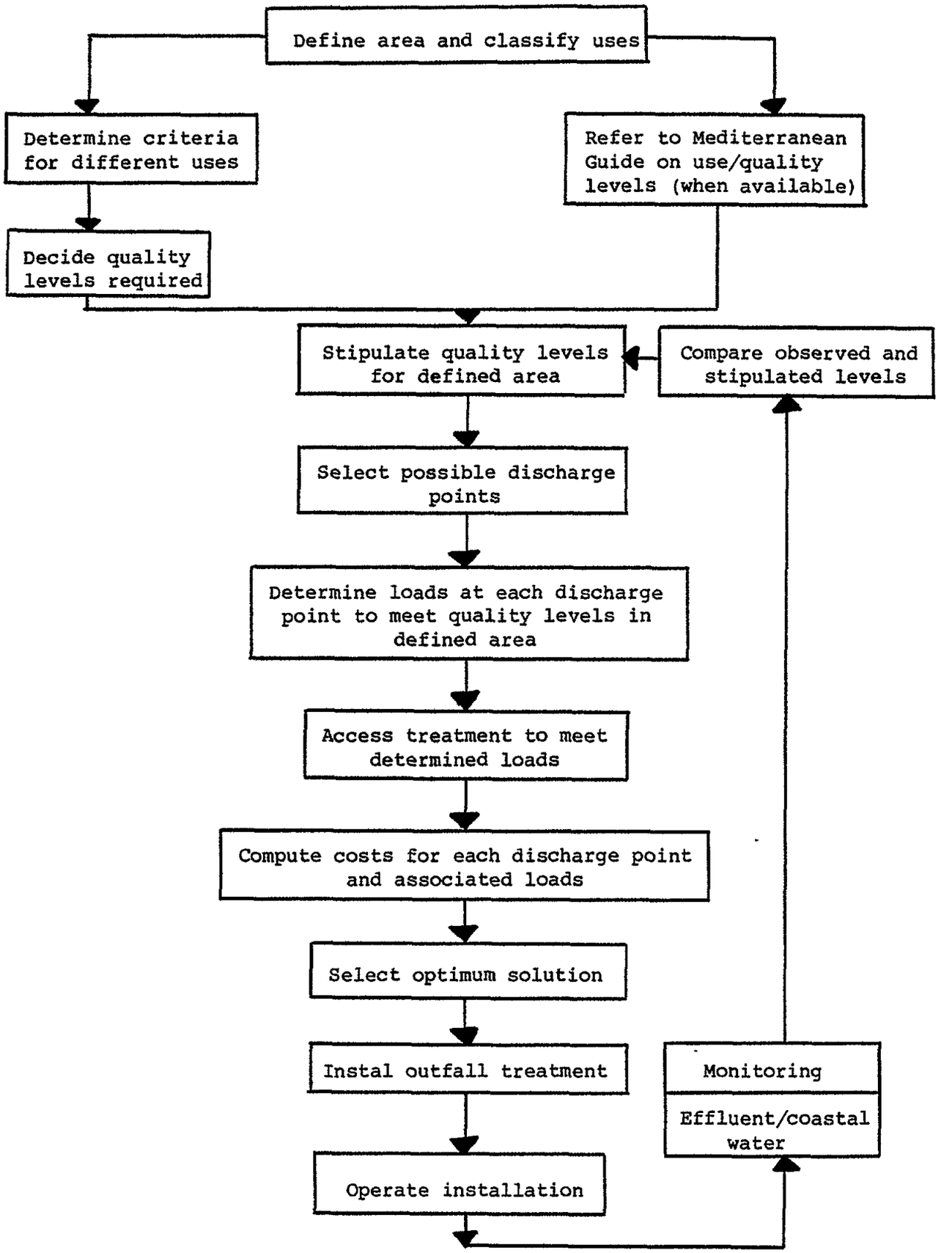


Fig 1 : Diagram illustrating procedure for control of discharges by environmental quality objectives based on water use.

V THE AUTHORIZATION PROCESS

25. The various steps that the authorization process and its implementation should follow are illustrated in Figure 1.

26. The upper left part of the diagram concerns the derivation of the environmental quality levels taking into consideration the area of the water body and the local uses. The quality objectives for a specific use will be similar throughout the Mediterranean and the process of deciding upon appropriate quality levels in individual cases will be simplified if uses are classified and criteria and quality objectives attached to each use. This is indicated in the upper right part of the diagram.

27. Recommendations have been made for the preparation of a classification of uses with relevant criteria and levels and a guide for Mediterranean purposes is to be prepared.

28. An example of a use/quality level is the Faecal coliform level for bathing water which was adopted as an interim criteria at a review meeting of the WHO/UNEP Project on Coastal Water Quality Control (MED VII) and is now proposed as a WHO/UNEP environmental quality criteria for recreational bathing waters in the Mediterranean. For satisfactory bathing areas, faecal coliform concentrations per 100ml should not be more than 100 in 50% of the samples and 1000 in 90% of the samples analysed, with a stipulated minimum of 10 samples. This objective for bathing water is applicable to all coastal water throughout the Mediterranean region.

29. The next stage is to decide what conditions and restrictions must be applied to the discharge in order to attain the required quality levels. There are two variables to be considered: the discharge point and the pollution load of the effluent. In general the longer the pipeline in the sea the greater the acceptable polluting load of the effluent. For a defined bathing water area there will be a seaward limit and the pipeline should discharge beyond this limit. For any given point of discharge the concentration of faecal coliforms in the effluent must be such that the dilution, dispersion and death-rate of the indicator will reduce the faecal coliform concentration at the boundary of the bathing area to within the limit given above. The longer the pipeline the greater the distance and time of travel of the sewage to the bathing zone and the greater the dilution when it arrives there. Depending upon local physical conditions it may be possible to locate the outlet so that the discharge plume does not reach the bathing zone.

30. It is here that comprehensive information about the physical, hydrological, chemical and meteorological conditions in the area is required in order to predict the behaviour of waste water discharged at different points. The availability of necessary data on the above factors and the relevant experience and skill of the technical staff will influence accordingly the accuracy with which this information will be assessed. The ideal is to prepare, from the data, a set of mathematical relations which will assist in predicting the way in which the discharge will travel and disperse under different conditions at different potential discharge points, and what effect it will have upon the zone of use. Existing information will probably need to be supplemented by surveys and investigations within the area. Pipelines and treatment plants are expensive and expenditure on exploratory surveys is relatively small. Even a limited survey can still provide valuable guidance and may result in substantial economies.

VI THE CONTROL SYSTEM

31. The discharger should be required to declare which of the listed potentially harmful substances are present or likely to be present in the effluent. The discharge of these substances should be only authorized up to stipulated levels. If the discharger wishes to include any other substance he should be required to apply for a new or additional authorization. A temperature limit may also be required.

32. The pollution effect is a function of concentration and volume. There should therefore be one limit for the maximum daily volume and one for the maximum rate of discharge.

33. All new discharges require an authorization. Any change in an existing discharge into the sea should be subject to scrutiny and a new authorization issued, if changes in its volume or in its composition have taken place.

34. When effluent control is introduced existing municipal and industrial discharges may face important problems in order to meet the new objectives.

35. It is desirable when introducing a new control system to distinguish between existing and new sources of pollution in order to apply a fair approach.

36. The authorization should be subject to review at stipulated intervals, perhaps one or two years.

37. All discharges, whether of domestic or industrial origin, vary with time in their composition. The variation may be cyclical or random, and of uncertain origin. This means that the concentration of listed harmful substances in a discharge will fluctuate about a median value and in occasion may exceed the stipulated limit without causing serious harm. It is therefore desirable to indicate a required frequency of compliance with the limits as a percentage of samples which must be within the established limits.

38. Percentage of compliances will be required for each substances as their relevant fluctuations vary. The compliance figures are not easy to select without some information about the effluent. A sufficient number of analyses should be available to permit statistical evaluation of the data to indicate suitable compliance objectives. These may be reviewed periodically as data accumulate.

Monitoring

39. The controlling authority will carry on a programme of sampling and analysis of the effluent to ensure that discharge is within the prescribed limits, and of seawater to confirm that the environmental quality within the defined zone meets the use objectives.

40. Normally it is sufficient that the samples of the effluents are taken from the pipeline near the shore line. When installing a new pipeline it should be an objective that facilities be provided to take representative samples through the establishment of a suitable access chamber.

41. Similarly it is also desirable that provision is made for gauging the flow. Spot checks may be used for small installations while continuous flow recorders and integrators should be installed for major discharges.

42. If the discharge point is outside the defined use zone, the monitoring of the environmental quality will be near the boundary where the maximum concentration of the effluent is expected. Where the outlet is within the use zone then the question arises where the receiving water should be sampled and what dilution, if any, should be considered. If the extreme case of no dilution were to be enforced, the discharge would need to be of the same quality as the use quality of the receiving water. If a dilution zone is permitted the samples will be taken at a specified distance or at a point on a fixed perimeter. Within this area, the environmental quality standard will not apply. The size of the zone will influence the quality of the effluent required, and therefore the extent of treatment necessary. Due to disproportionate expenses it would be difficult to justify a dilution zone in a bathing area and it can be argued that no outlet should be permitted in such an area.

Enforcement

43. Contravention of the provisions of an authorization should be liable to prosecution against the offender. Penalties for persistent transgression should be such that the cost of the required effective treatment is cheaper than paying relevant fines.

VII TREATMENT OF LIQUID WASTES FOR DISCHARGE INTO THE SEA

44. The selection of an appropriate treatment for municipal or industrial liquid wastes before their discharge into the sea should depend on the particular quality objectives and the absorptive capacity of the sea.

45. All liquid wastes should be screened to remove relatively large solid substances. Removal of oil and of grit should be undertaken by the use of appropriate installations. The above preliminary treatment should be considered as an objective for all liquid wastes discharged.

46. If unsettled discharge is made in a zone where there are no strong current or tidal movements, the bed of the sea around the outlet will be blanketed by settleable suspended solids. There, anaerobic conditions will develop. In these conditions, consideration should be given to removal of settleable matter through sedimentation tanks. Settlement will also effect a reduction in the heavy metal content of the sewage.

47. The objective of secondary treatment should be thoroughly investigated and justified. Dispersion and dilution in the sea is usually such that the BOD is unlikely to cause any significant oxygen depletion. Conventional secondary treatment reduces the coliform bacteria by about 95%. This is equivalent to the quite low dilution factor of 20 times.

48. The oxidation of ammonia to nitrate before discharge may have a deleterious effect because a more rapid growth of algae near the outlet will be encouraged by nitrate.

49. If further treatment is required, the application of chemical coagulants before settlement will assist in the precipitation of heavy metals and the reduction of colloidal matter.

50. Many of the potentially harmful substances exist mainly, and some exclusively, in industrial discharges. When these effluents are discharged directly from the industry into the sea the authorization is given to the factory and the responsibility to comply with the authorization rests upon the factory.

51. Factory effluents are often discharged into a sewerage system. This should be encouraged as it has a number of advantages. For example, the domestic wastes dilute the industrial wastes. In these circumstances the authorization is issued to the sewerage authority. This last is then responsible to ensure that the concentrations of potentially harmful substances are within the limits of the authorization. In case that the concentration provided by the authorization cannot be met it is necessary to reduce the quantity of certain of these substances which are discharged by the industry into the sewerage system. If the sewerage authority cannot require the factory to reduce its load it cannot meet the condition of the authorization. A solution may be the treatment of the sewage before it is discharged into the sea. This, however, is certain to be more expensive than reduction at the source. It is essential that the sewerage authority has the power to control all industrial waste disposal in the sewerage system. To this end industrial wastes entering the sewer should be subject to an authorization issued by the sewerage authority.

52. The total or partial use of the absortive and dilution capacity of the receiving water for one or more discharges should be taken into account when issuing authorizations. The question which may rise is whether this capacity will be used by one or more dischargers, or only part of it is used and treatment is applied to each discharge in order to balance the remaining unused capacity of the receiving waters. This last will be available for additional new requests for discharge.

VIII ORGANIZATION OF COASTAL POLLUTION CONTROL

53. Figure 2, which supplements Figure 1, illustrates the machinery of control. This may be divided in three parts, namely information, control and monitoring.

54. The extent to which the central government itself carries out executive duties or delegates them to local or regional authorities will be influenced by the resources of the local and regional authorities. It should also be considered that municipalities will often be responsible for sewerage and it might be deemed inappropriate for them to issue and enforce authorizations to themselves.

55. The evaluation of the data on which to determine the conditions to be incorporated to the authorization may be carried out at the information stage and passed on to the control stage at which the authorization is issued.

56. The discharge is monitored to ascertain the compliance with the authorization and the receiving water also to confirm its quality.

57. The analytical results are fed back to the control authority who is normally responsible for enforcement. These will also be sent to the information stage.

58. At regular intervals the data will be scrutinized and the conditions of the authorization reviewed.

59. The issue of the authorization and its enforcement may be the responsibility of a local organization, either a suitable existing organization which may accept this additional task or an authority organized for that purpose. Alternatively central government may retain the issue of authorization and enforcement powers. This operation may be made centrally or through local offices.

60. Monitoring frequency may vary. For example, it may be reduced when little or no bathing during cold weather takes place, and bathing is the considered use of the receiving waters.

61. Sampling calls for a measure of knowledge and skill but is not usually carried out by laboratory staff.

62. Analysis for potential harmful substances should be carried out by comparable analytical methods.

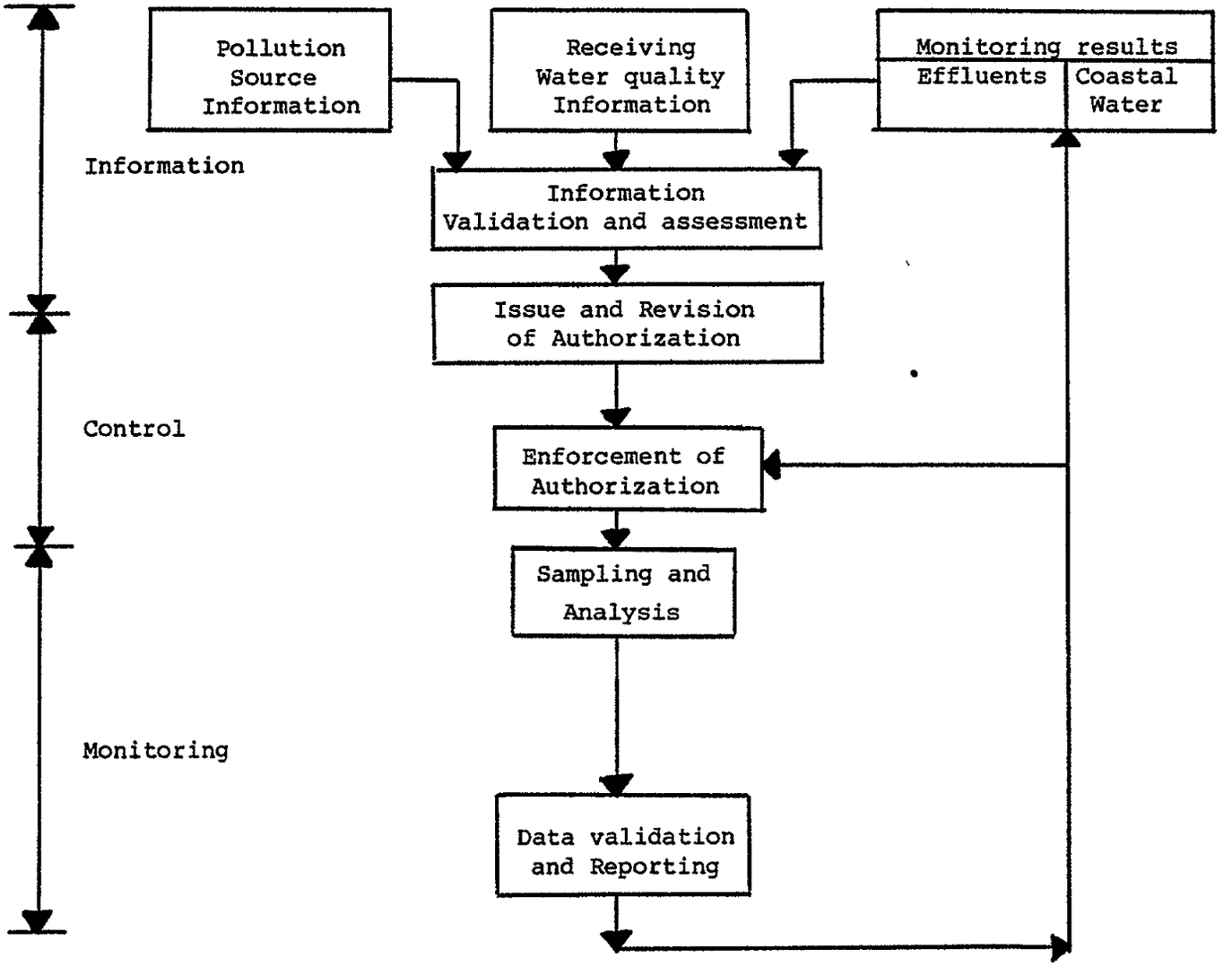


Fig 2 : Diagram illustrating the executive functions of coastal pollution control.

IX GENERAL REMARKS ON ALL WASTEWATER DISCHARGES

63. In order to give an authorization for a discharge it is advisable to consider the following items in the case of a sewerage system conceived within the framework of an adequate integrated plan :

a) Does it take into consideration an adequate zone of influence of the relevant pollutants and, as a consequence, of various uses which could be impaired and also of other discharges which may interact?

b) Have techniques of control at source which may give a more efficient removal of certain pollutants than subsequent treatment of diluted effluents, been studied?

c) Was a possible re-use of effluent considered prior to the discharge?

d) Does the sewerage system allow for possible extension of the treatment and/or disposal works in the future at a reasonable cost?

e) Does the final point of discharge occur away from coasts, or inside estuaries or confined marine waters?

f) Each standard should be conceived in statistical terms.

g) Regulations may be revised from time to time, but contradictory new regulations should not be promulgated after only a short time.

X ESTABLISHMENT OF OBJECTIVES, REQUIREMENTS AND STANDARDS

64. Generally speaking standards and criteria which concern the protection of marine waters against pollution are as follows (see Figure 3) :

- standards a_i concern the quality of waste waters to be treated. These are substantially inherent to source control action or in-plant treatment.

- standards b_i concern the quality of the effluent from the treatment plant.

- standards c_i concern the quality of effluent for certain re-uses.

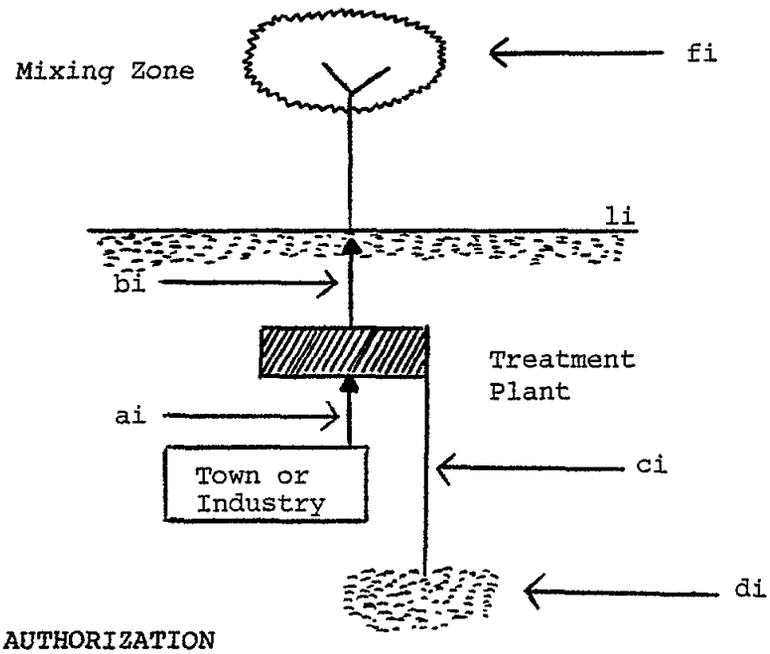
- standards d_i concern the quality of effluents after re-use, e.g. high concentration of nitrates which may affect the quality of ground water.

- standards e_i concern the coastal waters. These are substantially microbiological standards inherent to the protection of bathing waters and shellfish growing waters. Some physical standards are sometime applied, e.g. transparency, suspended solids, and others.

- standards f_i concern the quality of marine receiving waters near the point of discharge but outside the mixing zone. These are intended to protect satisfactorily the marine environment and ensure that the visual appearance of the seawater is adequate from an aesthetic point of view.

Other parameters concerning the quality of sediments and of benthic fauna may be monitored with the object of controlling and evaluating the impact on the environment.

(Figure 3)
Application of criteria and standards for the control of marine pollution for substances of group II



XI THE ELEMENTS FOR A DISCHARGE AUTHORIZATION

Municipal wastewaters of an essentially domestic nature

65. The distinction between essentially domestic municipal wastewater and other wastewaters which cannot be included in the first category is an important point as it influences the choice of regulations and technical solutions which must suit the needs of effective environmental protection.

66. For the first type of wastewaters more simple procedures of authorization may be used. A limited set of parameters may also be satisfactory for adequate control in such cases. These benefits are relevant if it is considered that the number of such discharges and the overwhelming importance of the simplicity of regulations and controls. These distinctions may also induce municipalities to control some pollutants at the source in order to re-classify their effluents in this first category.

67. Traditionally the distinction has been based on the COD and BOD ratio. It is often assumed that for the wastewaters treatable by conventional biological treatment this ratio should be less than 2-2.5. It is however known that biological treatment is able to withstand much higher concentrations of pollutants than the ones which could generally be accepted for discharge in the sea. This treatment at the same time shows only a limited efficiency from 40 to 80% depending on the toxicant.

68. The COD/BOD ratio may then be considered a useful parameter but generally speaking not sufficient to allow a satisfactory distribution between types of discharge. However if a more refined way of evaluation is not available, a practical solution as a first and useful approach is the use of COD/BOD ratio together with a direct analysis of the number and type of industries discharging their wastes into the sewage.

69. A better differentiation could be made by toxicity bio-assays on marine organisms. These tests aim at highlighting the persistent and more serious toxic elements. The unit toxicity contribution (relative toxicity emission rate divided by the number of inhabitants) should be considered, in order to compare different toxicities. In this way, the distribution made will avoid the distortion of comparison that different per capita water consumptions will produce.

70. In the case of industries whose effluents are consistent and characterised mostly by high organic load the number of inhabitants may be estimated by dividing the total daily BOD by the usual contribution, i.e. from 50 to 70 grams per inhabitant per day.

71. Another way to show such distinction is to make a comparison between the unit contributions of toxicants of Group II which are typical of a given discharge with the unit contribution which may be defined as typical of municipal wastewaters of essentially domestic origin.

72. It is therefore suggested that, for the purpose of any further investigation in this field essentially domestic municipal wastewaters such as the following should be considered.

1) Those which when diluted 1:50 - 1:100 do not produce chronic or behavioural effects on sensitive marine organisms;

2) Those which do not induce, around the point of actual discharge, a significant build-up of toxicants in marine organisms, with particular reference to those organisms which show the lowest level of biological regulation.

73. It may be accepted that unit contribution may not exceed fixed values by a certain percentage (e.g. 10-20%); this could be applied to single toxicants and, with a different percentage, to their cumulative presence.

Guidelines for the authorization of effluent discharges of essentially domestic origin according to the local receiving water capacity

a) Requirements concerning the quality of the effluents

74. a.1) Fine screening, or straining, and some level of floatable removal should be mandatory in any case. The practical specification of equipment performance (e.g. bar or mesh openings, holding time and surface loading, air addition can achieve better results than the setting of standards. A specified part of storm-waters should also undergo such pre-treatment, but to a lesser degree (e.g. coarse screenings).

75. a.2) Standards regarding settleable solids should be mandatory (e.g. from 0.1 to 0.5 $cm^3/_l$ in any of the following conditions:

- when straightforward sedimentation is feasible without exceptional costs (e.g. when it is not necessary to construct the plant underground or to construct many kilometers of main sewer);

- when the depth of discharge is less than a given value (e.g. from 10 to 20 meters);

- when the population served is in excess of a given value (e.g. from 10.000 to 50.000 inhabitants) taking into account at the same time local economic conditions and the urgency with which other sanitary works are needed.

76. Instead of the above standard, a more restrictive standard on settleable solids may be applied by various governments. For example, removal of 80% of the suspended solids or a maximum effluent concentration of 80-100 ppm may be required, whichever is the more restrictive.

77. The same conditions may be taken into account in order to make a decision about cases in which this kind of standard should be considered as mandatory.

78. A turbidity limit may also be considered together with, or in place of, the limit on suspended solids.

79. The removal efficiency of microparticles, which appear to be increasingly relevant to the adsorption and final destiny of many toxicants, may then be better taken into account.

80. a.3) Acute toxicity should be less than X units for a given marine organism. Total residual chlorine should be less than Y ppm. (e.g. for primary sewage and water consumption of 300 lit/capita, $X < 2,5$ toxicity units when diluted 1:10 - 1:50 is harmless if $Y < 0.02$ ppm).

81. a.4) Further treatment, according to the particular case, should be considered in order to comply with the standards for receiving waters which are dealt within the following paragraphs.

82. Naturally, these standards should be attained by the particular combination of treatment and disposal works which is least expensive and/or, taking all considerations into account, is more reliable and better adapted to protect the environment.

b) Micro-biological objectives and standards for bathing water and shellfish growing areas

83. It is suggested that the proposed WHO/UNEP interim environmental quality criteria for coastal recreational waters, shellfish and shellfish growing areas are applied to the extent possible by appropriate national legal and/or administrative measures as the minimal common measures safequarding the general public.

84. Some guidelines of a physico-chemical character have been put forward with regard to bathing waters and shellfish growing areas in some countries (e.g. France). These involve such parameters as turbidity, dissolved oxygen, transparency and oil.

85. It is considered that such standards can be achieved in most cases near the point of discharge of the effluent.

86. This procedure give a margin of safety for the coastal zones where bathing and shellfish growing are practised, as far as these particular parameters are concerned.

c) Requirements concerning the quality of the receiving marine waters in the proximity of the point of discharge

87. Near the point of discharge, certain standards are necessary to ensure a satisfactory degree of treatment and disposal with reference to the organic load and easthetic aspects.

88. The following parameters could be taken into consideration : BOD, DO, $N\text{-}NH_4^+$, MBAS, suspended solids, turbidity, transparency, nutrients.

89. As an example, an ordinary primary sewage with initial dilution of 1/80 - 1/100 might produce the following concentrations outside the mixing zone :

BOD $\leq$ 4 : 6 ppm	DO $\geq$ 85% - 100% saturation
MBAS $\leq$ 0.2 ppm	$N\text{-}NH_4^+$ $\leq$ 0.4 + 0.6 ppm
Suspended solids $\leq$ 5 : 10 above natural level	
Toxicity concentration $\leq$ 0.05 toxicity units	

90. Although BOD is widely considered as having a very small meaning for discharge in open seawaters, it is better to take it into consideration as opinions on its usefulness differ.

91. The level of dissolved oxygen in open Mediterranean waters and at depths less than 60 m, which are relevant to the applied discharge of effluents, is very seldom less than 85% of saturation. However, in certain high growth areas, bottom waters in some periods of the year do show a lower concentration of dissolved oxygen. A decrease in the surface water concentration may be induced by the effect of rising bottom waters. This should be distinguished from oxygen depletion induced by the organic load of the discharge.

92. Monitoring of all parameters, except toxicity concentration, may be carried out by means of sampling.

93. Toxicity in receiving waters outside the mixing zone should be evaluated according to the measured toxicity characteristics of the effluent and the measured "minimum" degree of initial dilution in situ.

94. For larger discharges, direct evaluation of possible long term effects, mainly on benthic fauna and flora, are also suggested by means of quantitative environmental assessment. For smaller discharges the simplest routine control method may be the measurement of the quality of the effluent and of the degree of "minimum" initial dilution.

Effluents not definable as essentially domestic

95. No distinction a priori is assumed between different types of wastewaters. The same guidelines apply to all wastewaters.

a') Requirements concerning the quality of the effluents

96. a'.1), a'.2), a'.3) : the same as a.1), a.2), a.3) above respectively.

a'.4) : the unit mass emission rates for each discharge should be, if necessary, reduced as to meet two objectives :

97. 1) Taking into account the initial dilution, water quality standards set up for the various constituents outside the mixing zone must comply with, and

2) Every authority may in any case require reduction to a certain degree of the emission of some pollutants.

98. The evaluation of pollution limits depends on scientific and economic factors and also on other criteria required by the competent authority involved.

99. In any case, it is suggested that unit mass emission rates rather than concentrations, should be controlled as this principle helps towards the concervation of water resources.

100. When only concentrations are limited by the regulations, standards may be complied with by artificially increasing the consumption of process waters.

b' Micro-biological objectives and standards for bathing water and shellfish growing areas

101. The guidelines put forward in b) above are also relevant here as far as micro-biological aspects of pollution are concerned.

102. For all other substances in Group II, satisfactory water quality and environmental protection should be achieved just outside the mixing zone of the effluent.

c' Requirements concerning the quality of the receiving marine waters in the proximity of the point of discharge

103. When the "minimum" ratio of initial dilution occurs, "safe" concentrations of substances of Group II must be achieved near the point of discharge, outside the mixing zone.

104. These "safe" concentrations can be formulated at different levels :

- less "safe", but mandatory and readily complied with in a short time;

- quite satisfactory, but attainable only in the long run.

105. For the evaluation of safe concentrations, one of the following criteria may be followed (which ever is the more restrictive) :

- results of behavioural and chronic toxicity tests, when they are available; (An average value may be chosen, when differences exist between results)

- concentrations deduced from short-term acute toxicity tests dividing LC_{50} by an application factor which should have an order of two magnitudes;

- concentration of the substance at which level the most sensitive organism cannot fully regulate the concentration in its body.

106. It may be that "safe" concentrations so determined happen to be inferior to the natural background concentration in seawater. This would obviously be unrealistic.

107. The respect of particular "safe" concentrations for a given substance "C_e can be incorporated in the design as a function of following factors :

$$C_e = \frac{C_o + (S - 1) \times C_s}{S}$$

where :

C_o = concentration of the substance in the effluent

S = initial dilution factor just outside the mixing zone

C_e = concentration of the substance

C_s = natural background level in the seawater (which must be known for the area e.g. from samples taken off the coast)

108. Viceversa, for the purpose of control the "minimum" dilution rate "S" must be measured in order to verify

whether $C_o \quad C_o^*$

$C_o \quad C_o^* = C_s + S\ (C_e - C_s)$

where C_o^* = max concentration of the substance acceptable in the effluent in order that

$C \quad C_e$

109. If "S", "C_e", and "C_s are known, it is possible to calculate the maximum concentration (of the given substance) in the effluent to be discharged, C_o^*, in order to be $C \quad C_e$.

110. The discharge will be finally authorized if, for every substance $C_o \quad C_o^*$.

XII COLLECTION AND SUBMISSION OF INFORMATION

111. Article 13 of the Protocol for the protection of the Mediterranean Sea against Pollution from Land-based Sources, provides for the collection and submission of information on the application of this Protocol.

112. More specifically such information should include inter alia :

a) Statistical data on the authorizations granted in accordance with article 6 of the Protocol;

b) Data resulting from monitoring as provided for in article 8 of the Protocol;

c) Quantities discharged from their territories;

d) Measures taken in accordance with articles 5 and 6 of the Protocol;

113. To this end the submission of information (by the Parties concerned) as outlined in the draft form given in Annex I and Annex II are suggested.

Form of report for permits and approval issued

1. Issuing authority :.....

2. Date issued :.....

3. Period of validity of permit :.....

4. Type and size of waste source :.....

.....

5. Total quantity (volume discharged per year) :.....

6. Discharge pattern :.....

.....

7. Chemical composition of wastes, major constituents :.....

.....

.....

8. Physical, chemical and biochemical properties :.....

.....

.....

9. Initial dilution achieved at the point of discharge into the marine environment : .....

.....

10. Discharge site :

Longitude :..... Latitude :.....

Depth of discharge : .....

Distance of nearest coast : .....

11. Additional information (relevant factors listed in Annex III of the Protocol : .....
.....
.....

12.. Elements for an authorization discharge :

12.1 Essentially domestic liquid wastes

a) COD/BOD ratio : .....(than 2 - 2.5)

b) Dilution of liquid wastes at which no chronic or behavioural effects on sensitive marine organisms are produced : .....
.....(range of 1:50 - 1:100)

Quality of effluents :

c) Fine screening or straining mandatory : .....

d) i) Settleable solids standards mandatory (0.1 - 0.3 cm^3/lit) :

- when depth of discharge is less than 10 - 20 m.
- when other local conditions justify these or more restrictive standards

or

ii) Removal of suspended solids (80%) :.....

iii) Turbidity :.....

e) i) Acute toxicity less than ..... units for .....

..... (relevant marine organism)

ii) Chlorine residual less than .....

Standards for bathing waters and shellfish growing areas :

f) i) Faecal coliform counts per 100 ml:

.....

Faecal streptococci counts per 100 ml:

.....

ii) Turbidity : .....

iii) Dissolved oxygen :.....

iv) Transparency : .....

v) Oils : .....

Quality of the receiving marine waters in proximity to the point of discharge :

g) i) B O D : .....

ii) Oxygen demand :.....

iii) $N - NH_4^+$: .....

iv) M B A S : .....

v) Suspended solids : .....

vi) Toxicity concentration : .....

h) Initial dilution : .....

12.2 Effluents which cannot be defined as of essentially domestic type

Quality of effluents :

a) Fine screening or straining mandatory : .....

b) i) Settleable solids standards mandatory (0.1 - 0.3 cm^3/lit) :
(see above 12.1, d) i))

or

ii) Removal of suspended solids (80%) :.....

iii) Turbidity :.....

c) i) Acute toxicity less than ..... units for .....
.....(relevant marine organism)

ii) Chlorine residual less than .....

Standards for bathing waters and shellfish growing areas :

d) i) Escherichia coli counts per 100 ml consistently less than 100 :

.....

Maximum tolerable level not consistently greater than 1000 per 100 ml : .....

ii) Turbidity : .....

iii) Dissolved oxygen :.....

iv) Transparency : .....

v) Oils : .....

Quality of the receiving marine waters in proximity to the point of discharge :

"Safe" concentration for a given substance "C_e" based on toxicity tests:

Substances	Toxicity (LC_{50})	Concentration ($100:LC_{50}$)
.....	.....	.....
.....	.....	.....
.....	.....	.....

$$C_e = \frac{C_o + (S - 1) \times C_s}{S}$$

where :

C_o = concentration of the substance in the effluent

S = initial dilution factor just outside the mixing zone

C_e = concentration of the substance

C_s = natural background level in the seawater (which must be known for the area e.g. from samples taken off the coast)

ANNEX II

Form of annual report concerning the discharge of liquid wastes in the Mediterranean

It should be noted that the figures for the quantities of substances discharged relate to the actual amounts discharged during the year under report and not the quantities licenses.

The purpose of this form is to facilitate an assessment of the discharge of liquid wastes into the waters of the Protocol area. The form must be completed for each calendar year in retrospect and submitted to the Organization during the year following that to which the discharge relates.

1. Discharge area :

a) Location :.....

Longitude :.....Latitude :.....

b) Depth :.....metres

c) Tidal flows :

Direction :.....Maximum speed :.....

d) Type of wastes discharged :(i.e. domestic, industrial, mixed).....

.....

e) Other relevant information :.....

.....

2. Industrial liquid wastes discharge :

a) Year of issue of the permits concerned :.....

b) General description of wastes :.....

.....

c) Method of discharge :.....

.....

d) Total quantity of discharges :.....

e) Total quantity of discharges licensed :.....

f) Total quantity of insoluble solids :.....

g) Total quantity of particulate organic components :.....

h) Total quantity of trace contaminants of Annex I substances :

Mercury.....

Cadmium.....

Organohalogen compounds (specify).....

Others.....

i) Total quantities of the following metals :

Arsenic.....Nickel.....

Chromium.....Zinc.....

Copper.....Lead.....

Others (specify) :.....

j) Any other compound present in appreciable quantities :.....

.....

k) Total quantity of strong acids :.....

Strength/pH.....

l) Total quantity of strong alkalis :.....

Strength/pH.....

m) Toxicity of waste (give LC_{50} values and names of species tested. Where more than one waste is involved, give toxicity criteria, e.g. 96-hour LC_{50} values not below 10000 ppm for Crangon crangon or Agonus cataphractus) :

.....

.....

n) Monitoring authority :.....

o) Other relevant information :.....

.....

3. Municipal liquid wastes discharge with or without industrial wastes :

a) Year of issue of the permits concerned :.....

b) General description of wastes :.....

.....

c) Method of discharge :.....

.....

d) Total quantity of discharges :.....

e) Total quantity of discharges licensed :.....

f) Total quantity of insoluble solids :.....

g) Total quantity of particulate organic components :.....

h) Total quantity of trace contaminants of Annex I substances :

Mercury.....

Cadmium.....

Organohalogen compounds (specify).....

Others.....

i) Total quantities of the following metals :

Arsenic.....Nickel.....

Chromium.....Zinc.....

Copper.....Lead.....

Others (specify) :.....

j) Any other compound present in appreciable quantities :.....

.....

k) Total quantity of strong acids :.....

Strength/pH.....

l) Total quantity of strong alkalis :.....

Strength/pH.....

m) Toxicity of waste (give LC_{50} values and names of species tested. Where more than one waste is involved, give toxicity criteria, e.g. 96-hour LC_{50} values not below 10000 ppm for Crangon crangon or Agonus cataphractus) :

.....

.....

n) Monitoring authority :.....

o) Other relevant information :.....

.....