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HARMONIZATION OF METHODOLOGIES AND STANDARDS FOR EVALUATION OF BATHING WATER AND BEACH QUALITY

Report on a WHO Regional Workshop
for the Black Sea Riparian Countries
Istanbul, Turkey
22-25 November 1994

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WATER QUALITY

By the year 2000, all people should have access to adequate supplies of safe drinking-water, and the pollution of groundwater sources, rivers, lakes and seas should no longer pose a threat to health.

Abstract

The risks to human health from recreational use of polluted coastal water and unsafe beaches are of concern to the public world-wide and of increasing interest to the scientific community. The linkages between tourism, environment and health are complex and multiple. The Black Sea Environmental Programme is a major international initiative to address problems associated with the Black Sea, including those of a socioeconomic nature, regarding water supply and quality, and rapid assessment of land-based sources of pollution. This regional seminar initiated activities related to the monitoring and assessment of recreational water and bathing quality. The six Black Sea countries agreed to initiate monitoring during 1995 and to harmonize methods and standards. Participants proposed to meet one year after this seminar to review experiences and findings, and to make future plans.

Keywords

SEAWATER
WATER POLLUTION - prevention and control
WATER QUALITY
BATHING BEACHES
ENVIRONMENTAL MICROBIOLOGY - standards

Contents

Context

The Black Sea Environmental Programme is an international initiative, supported by the Global Environment Facility, with the following objectives:

- strengthening and creating regional capacities for managing the Black Sea ecosystem
- developing an appropriate policy and legislative framework for the assessment, control and prevention of pollution and maintenance and enhancement of biodiversity
- facilitating sound environmental investments.

The World Health Organization assists the Black Sea Environmental Programme by providing technical advice on public health-related topics to the Activity Centres for Routine Pollution Monitoring in Turkey and for Special Pollution Monitoring in Ukraine. It participates in working parties associated with the activity centres and provides technical advice and guidance at meetings. Within the overall strategy of integrated coastal zone management, WHO is specifically responsible for elaborating the strategy for common methods and sanitary standards for bathing water, beach quality and drinking water, and for improving and rationalising drinking water supplies.

Development of tourism of the Black Sea coast is an objective of several riparian countries. Such development has important economic benefits and also interacts with both health and environment. Thus tourist development impacts upon environment, while the environment itself may attract tourists (whether as "ecotourists" or "sun worshippers"). In either case environmental quality is an important factor in successful tourism and health.

The benefits associated with relaxation through tourism are widely recognised. However, tourism is also associated with certain health hazards. Some of these are similar to those encountered elsewhere (for example, poor drinking-water quality), while others are related to changes in behaviour of tourists (for example, excessive exposure to sunshine and UV radiation, bathing in polluted coastal waters). A healthy and attractive environment is vital to effective tourist development.

Monitoring of environmental health in relation to tourism is relatively poorly developed along the Black Sea coast. Furthermore, tourists are increasingly demanding intelligible information regarding environmental health and resource facilities with which to select their holiday destinations. High quality, standardised data and effective data dissemination are essential if investment decisions are to benefit from an adequate information base and to serve as an information base for tourists.

Introduction

The WHO/Black Sea Environmental Programme Regional Workshop on Harmonization of Methodologies and Standards for Evaluation of Bathing Water and Beach Quality was held at Istanbul Technical University, 22-25 November 1994. The workshop was cosponsored by WHO and the Black Sea Environmental Programme (BSEP). Local coordination and support was provided by the BSEP Activity Centre for Routine Pollution Monitoring, housed at Istanbul Technical University (ITU).

The purpose of the workshop was to prepare a harmonized monitoring programme throughout the Black Sea region and a programme of monitoring activities for 1995. The elements to be agreed upon were:

- criteria for selection of participating beaches
- selection of parameters to be monitored
- criteria for selection of sampling stations
- sampling methods
- conservation methods
- transportation methods and rules
- analytical methods
- standards
- statistical evaluation
- data processing and reporting, including elaboration of maps.

The workshop was attended by 20 participants from six countries (Bulgaria, Georgia, Romania, Russian Federation, Turkey and Ukraine). Invited speakers at the workshop were Dr Hasan Ali San (ITU), Mr Peter Blanner and Ms Susy Lauesen (County of North Jutland, Denmark); Dr Bjørn Jensen (Water Quality Institute, Horsholm, Denmark); Dr Bent Fenger and Mr Jamie Bartram (WHO European Centre for Environment and Health, Rome).

Mr Christopher Cosslett welcomed participants to the workshop on behalf of the Global Environment Facility (GEF) Black Sea Environmental Programme. He outlined the overall Black Sea Environmental Programme and the position of the regional seminar within it. A Programme Co-ordination Unit (PCU) had been established in Istanbul in January 1994, as had a series of activity centres and working parties in different thematic areas. Mr Cosslett described the importance of bathing water and beach quality to the health of local residents and to tourists, and to the economies of areas with tourist industries, emphasising the importance of linking monitoring activities to remedial action. He further referred to the importance of harmonization to enable tourists to make informed decisions and to facilitate management decision-making.

Professor Sarikaya spoke on behalf of the host institution, the ITU, which is also the Activity Centre for Routine Pollution Monitoring for the Black Sea Environmental Programme. Professor Sarikaya welcomed the participants to Istanbul and to ITU. He referred to the impact of urban growth on beach utilisation and quality. Professor Sarikaya summarised the evolution of ITU and described its principal facilities and services.

Workshop participants agreed that the chair of the meeting should rotate among represented countries. Professor Sarikaya acted as chair for the first morning and for the closing session. The other persons who acted as chair were Dr Radu Mihnea (Romania), Dr Tsvete Veselinova (Bulgaria), Mr Alexander Sh. Tsertsvadze (Georgia), Mr Tuncay Demir (Turkey), Mr Andrej Buthijarov (Ukraine) and Dr Alexander Mamaev (Russian Federation).

Presenters were asked to record discussions following their presentation and liaise with chairpersons in recording the discussion and conclusions for the report.

Dr Bent Fenger conveyed the greetings of Dr J. Asvall, Regional Director of the WHO Regional Office for Europe, who wished the workshop every success as an important step in the implementation of the Black Sea Bathing Water and Beach Quality Monitoring

Programme. Dr Fenger gave an account of the European Centre for Environment and Health. The Rome Division of the Centre was responsible for WHO contributions to the BSEP. Dr Fenger noted that the role of WHO was to provide expertise to facilitate implementation of the programme in close cooperation with the Activity Centre for Routine Pollution Monitoring in Istanbul and the national focal points, the intention being that these institutions should take over responsibility for operating the programme once it had been established.

During the closing session Professor Sarikaya spoke on behalf of the host institution and Activity Centre for Routine Pollution Monitoring. Professor Sarikaya noted that the activity centre had only recently been established and that this was the first meeting organised within its area of responsibility. He trusted that the event had run smoothly and emphasised that restructuring would lead to further improvements in support capacity for such events.

Mr Bartram spoke on behalf of WHO. He expressed thanks on behalf of the organisers to all those who had contributed to ensuring the successful outcome of the event, specifically referring to the secretarial support, the host institution (ITU), consultants from the Water Quality Institute and the County of North Jutland, and all individual participants. Mr Bartram encouraged participants to use and continue to develop the contacts they had developed at the workshop and emphasised that WHO would be pleased to provide advice and support where appropriate. In conclusion, Mr Bartram conveyed the best wishes from Dr Laurence Mee who had sent his apologies for being unable to attend the closing session and referred to the role of PCU in the development of the seminar and overall programme.

Topics and Discussion

Criteria for the classification of beaches

Introduction

The introduction focused on the question: why should we classify? Two reasons were proposed: to determine an order of priority for how and when to solve problems; and to inform tourists. The components of a possible classification were described and an overview given of the conditions that might influence how a tourist decides where to bathe. It was proposed that only five components should form the criteria for the final classification: bathing zone, beach material, beach surroundings, actual bathing and potential influence. An example of a classification of six beach classes was shown.

During a subsequent session, revised lists of objectives for classification of beaches, components of beach registration, proposed parameters, revised examples of beach classes and a flow chart were presented.

Discussion

It was suggested that the classification also include "designated sensitive areas". The conflict between tourism and protection of the environment was discussed.

Whether the classification corresponded to other classifications of beaches, for instance, in the Mediterranean, was discussed. Examples of classifications of waters were known, but not of beaches.

It was also proposed that positive components, such as the presence of life guards and first aid facilities and a warning system for temporarily dangerous sea conditions, be included. It was suggested that the same scale of maps was used for the registration of beaches: for instance 1:25 000. Methods for measuring direction and speed of sea current were discussed.

Classification should be used for coastal zone management as well as for informing the public. A revised set of objectives for classification and examples of beach classes were agreed upon. Classification is dynamic; it can be changed when conditions change.

Selection of parameters

Introduction

Factors affecting the risk of infection of beach visitors and bathers were presented, as was a list of potential harmful micro-organisms from bathing waters. It is impossible to include all relevant parameters in a monitoring programme. A selection of parameters that can act as indicators of quality must be made. The parameters used in the European Union were presented, as was the proposed revision of the list. A set of parameters was proposed for bathing water monitoring of the Black Sea coast.

Some parameters are assessed qualitatively: for example, the direction of the wind and sea current, tar and oil on the sea, and foam on the coast. Others such as tar and litter on the beach may be assessed quantitatively.

Discussion

Whether "precipitation" should be registered when taking samples and the value of measuring pH and of phenols as indicators of industrial pollution were discussed. Also discussed was the feasibility of using phenols as indicators of chemical pollution, and *E. coli* and faecal streptococci as indicators of faecal pollution.

The value of measuring eutrophication in a bathing water programme was discussed. The relevance of various parameters such as nitrogen, phosphorus and BOD_5 was debated.

Recent epidemiological evidence regarding health impacts of sea bathing was discussed.

Problems with vira in the Ukrainian monitoring programme were raised. New results from the United Kingdom show a correlation between faecal streptococci and disease assumed to be largely virally mediated, indicating that measuring faecal streptococci should be considered essential.

The initial objective of monitoring was to choose as few parameters as possible but to ensure their relevance. When the programme is implemented, further parameters could be added to the monitoring programme.

Selection of sampling stations

Introduction

The rationale for locating sampling stations was described. It was stressed that the sampling stations must be representative of the quality of the water.

Bathing stations and control stations were described, and general advice regarding the distance between sampling stations was given.

Examples of selection of sampling stations on beaches in the Mediterranean and in Denmark were provided, and the importance of specific identification of each station was stressed.

Discussion

Factors influencing the location of sampling stations along the total coastline were discussed. It was agreed that along bathing beaches only bathing stations were to be located.

Sampling methods, conservation and transportation of samples

Introduction

Sampling of bathing water for measuring microbiological and chemical parameters was described and the need for representative samples was emphasised. Types of sample, sample equipment, collection of samples, transport and storage of samples, recording and reporting, and quality assurance aspects were covered.

Discussion

The issue of equipment availability was raised. If samples were to be handled in a uniform way in participating laboratories, specific equipment to ensure this should be available or provided before the programme starts.

Sampling at chest depth was discussed, particularly how samples should be taken. It was suggested that it is not important how chest height is reached. In some cases water may be polluted to an extent that could pose a health risk to the sample collector. In that case measures should be taken to prevent exposure of the sample collector either by protective clothing or by collecting the sample by boat.

The question whether plastic bottles could be used for sampling was raised, because they are more durable. This led to an agreement on using only glass flasks in this programme, since they are easier to clean properly.

Analytical methods

Introduction

Procedures for making microbiological examinations of water samples using the most probable number (MPN) method were described. The parameters included in this presentation included total coliforms, faecal coliforms and faecal streptococci.

Procedures for differentiation of coliform bacteria were described, as well as techniques for measurement of transparency and turgidity.

Discussion

There was a discussion regarding whether the MPN or membrane filtration (MF) method should be applied in the programme. MPN procedures were familiar to all members, while MF had been implemented at only a few laboratories. However, MF was increasingly used and was considered preferable. Costs related to the different methods were discussed.

There was a general concern whether harmonization of methods could be achieved without supply of equipment and consumables while depletion of media, etc. would lead to use of whatever stocks might be available.

Standards and statistical evaluation

Introduction

The microbiological standards for *E. coli* and faecal streptococci proposed by European Union were presented, and standards for the BSEP were discussed. The European Union control system require more than 5% of the samples to comply with the limit values for failure, which implies that at least 20 samples should be collected during the bathing season.

A system for evaluating data based on a fixed number of spot samples taken during a bathing season was described. The system consists of four phases:

1. Identification of sampling stations, definition of control period, control parameters and control requirements
2. Data collection
3. Control calculation
4. Evaluation of the development of bathing water quality.

To calculate whether the bathing water requirements have been fulfilled, the so-called 'critical value' C, which aggregates the data from one season, was introduced. The value is based on the assumptions that the data from one sampling station are independent and follow a logarithm of the analytical result. The bathing water requirements are fulfilled if C equals or is below the natural log to the limit value in less than 5% of the samples.

In this system the sampling frequency is set at 10 times a season. The data are then evaluated after each bathing season. If the limit value is statistically exceeded more than 5% of the time, the sampling frequency is increased to 20 times a season or four times/month the following season. If the limit values are met for two successive seasons, the sampling frequency is decreased to five times per season or once per month the following season. Furthermore, if the limit values are not met in three successive seasons, bathing should be prohibited.

Discussion

There was a general discussion concerning sampling frequency and the length of the bathing season.

The question of prohibition of bathing in case of severe pollution was discussed.

The issue of including vira in the water quality assessment was raised. According to recent findings, faecal streptococci have been shown to correlate with the incidence of disease assumed to derive from pathogenic vira. They may therefore act as indicators of the likelihood of health risk due to exposure to vira.

Introduction to the beach registration table

Introduction

A visit was made to the beach at Kilyos. The participants split into groups and completed Table 1.

The method of quantifying tar-balls and litter was demonstrated, and participants undertook the exercise themselves. Among the numerous small tar-balls were a number of items of medical waste, including syringes and broken glass bottles.

The mayor demonstrated the use of the local sewage collecting tank and the pipeline leading the sewage to the treatment plant. The treated water was led to a small river near the beach. At the time of the visit - which was outside the bathing season - sewage was being discharged directly onto the beach.

Sampling of water for bacteriological analyses was demonstrated, and Table 2 (in draft form) with information about conditions at the sampling time was completed.

Discussion

The participants made various observations and recommendations regarding the two tables on beach and bathing water registration and it was agreed that these would be incorporated into revised tables (presented here).

The proposed parameters were discussed, as were the methods and the units.

Data processing

Introduction

The introduction was based on the computer programs BATHSYS and MAPINFO. The overall structure of these programmes was reviewed. BATHSYS is programmed in d-base 5, and contains four databases for all the data from the bathing water monitoring programme, with a graphical facility to present the data programmed in PASCAL. MAPINFO is a geographical information system (GIS) that has been configured directly to the BATHSYS. On leaving BATHSYS and entering MAPINFO, there is a map with the bathing water stations on the screen.

Outputs from BATHSYS are a number of tables, containing both "raw" data from any station and computed data. The "Annual Report" provides direct information concerning the quality of the bathing water of the station in question in a particular year and demonstrates whether the quality of the water meets agreed limits.

Table 1. Components of the beach registration

Surroundings	
Hinterland	forest, hills fields, meadows, steppe, swamps, desert, mountains, industry, urban area, military areas, power plants, airports, river mouth, harbours, rural area
Accessibility	road, track, public transport, no access
Facilities	restaurants (no.) hotels (no.) camping grounds (no.) summer resort area (y/n) public toilets (no.) parking (y/n) bins (y/n) information sources (signs, offices) (y/n) first aid posts (no.) lifeguards (no.) swimming safety warning (y/n) fresh water/drinking water taps (no.) no facilities
Beach	
Area	length, width (meters)
Beach material	sand, gravel, stones, rock, swamp (appropriate percentage coverage)
Litter survey	rubbish and tar-balls (amount in kg/m^2) algae and oil (amount according to code list)
Visitors	estimate of numbers according to season
Water environment	
Bathing zone	sea current (m/sec) steep slope, gentle slope bottom material: sand, gravel, stones, rock (percentage coverage)
Usage	jetskiing yachting fishing (shore, boat)
Water quality	monitoring programme results (in units as stated in manual) potential influences (sewage outlets, river mouth)
Counter indications	
Designated sensitive areas	resting place for waterfowl, breeding sanctuary for rare birds, conservation area, other kinds of protected area

Table 2. Proposed parameters

*A. *Physical*	Air temperature (measured) Water temperature (measured) Speed of surface current (estimated) Direction of surface current (code list) Precipitation (measured) Water colouring (code list) Water transparency (measured)
*B. *Visual*	Tar on the beach (measured) Foam on the beach (code list) Litter on the beach (measured) Algae on the beach (code list)
*C. *Microbiological*	*Escherichia coli* (measured) Faecal streptococci (measured)
D. *Chemical*	Phenols (measured or code list) Oil on the sea surface (estimated, standard) pH (measured) BOD_5 (measured)

* Essential analyses on all samples. Code lists and methods for measuring the parameters will be contained in the manual.

The parameters from Table 2 can be shown as graphs, and the set-up changed according to the use.

From MAPINFO it is possible to locate a station and show what kinds of data are produced from it.

Some examples of maps from the Turkish bathing water programme were also presented.

Discussion

Whether a uniform numbering system for all beaches and bathing water stations should be developed was discussed.

The issue of quality limits was considered a political question, and as such should be decided upon by each country.

It was also mentioned that the authority to edit the limit values (and other vital information in the computer programs) had to be placed at a central and generally accepted level. Participants suggested that the system be extended to contain the information on beach registration.

Some of the participating countries already had GIS and/or EDP equipment.

Reporting to the public

Participants focused on the question: why report to the public? Different possibilities for reporting to the public were presented. Examples of publications describing water and beach quality including facilities on the beach were presented.

The "Blue Flag" programme has run in several countries since 1987. A description of this campaign was given as well as examples of criteria for obtaining the "Blue Flag".

Conclusions and Recommendations

All six countries agreed to implement the programme discussed during the 1995 bathing season and to meet again in winter of 1995-1996 to review experiences and to plan future activities.

The following 18 conclusions were agreed upon as procedures to be followed in the monitoring programme for bathing water and beach quality of the Black Sea. Unless otherwise noted they were intended to be long-term agreements. WHO was requested to ensure the incorporation of these conclusions into a revised manual, based upon the background material provided at the workshop and to disseminate this to workshop participants.

In the following "beaches" are defined as "areas along the shore where people may go bathing".

Conclusions

1. The overall process of development of monitoring is outlined in Figure 1.

2. The objective of the desk work will be to identify all actual or potential beaches, to collect maps of these beaches where available and to collect information regarding potential influences on quality (for example, river mouths, discharges, groundwater flows).

3. The initial beach survey will take account of the factors listed in Table 1. If not stated otherwise, occurrence of the components should be described with a "yes" or "no".

4. Beaches will not be included in routine monitoring if recreational use is to be discouraged because use would be dangerous and/or use would prejudice other factors (such as a designated ecologically sensitive area).

5. Routine monitoring of water and beach quality will be undertaken on all actual or potential beaches except those identified in conclusion 4.
6. Water quality sampling stations will be located on all monitored beaches according to the following criteria:

- bathing stations will be located along beaches where bathing takes place
- the distance between the stations on beaches should not exceed 500 metres

- along beaches with potential threats against the water quality (e.g. polluted outlets, intensive tourist resorts, river mouth), the distance should be less than 200 metres
- control stations will be located along beaches where bathing does not take place, but also where knowing the quality of the water is essential for management reasons.

7. Samples of bathing water will be collected from all sampling stations twice per month during the bathing season, defined as ranging from beginning of May to the end of September: that is, 10 times per bathing season.

8. All samples will be collected and transported to the laboratory according to the following guidelines. For sampling of bathing water for microbiological analyses, 500 ml clear glass bottles equipped with either ground glass stoppers or screw caps with a rubber liner will be used. The glass bottles should be properly cleaned before use (that is, rinsed with detergent and flushed with demineralized water to remove all detergent from the bottles), and dry sterilised at 160 ^{o}C for 2 hours or autoclaved at 121 ^{o}C for 15 minutes. The collection of samples should be made in water of chest height from a depth of approximately 30 cm below the surface. The sample should remain until processing in the bottle used for collecting the sample. After sampling the bottle should be labelled according to the instructions in Table 1 completed at the time of sampling and immediately placed in an insulated box with ice. Samples should be transported to the laboratory in the insulated box, placed in the refrigerator and processed within 24 hours after sampling. A sample that cannot be processed within 24 hours it should be discarded. A sample not received in a "cool" condition in the laboratory should also be discarded.

   The samples must never be frozen.

   The samples at a given sampling station should be taken at the same time of the day every time.

   Detailed procedure for collection of samples will be contained in the manual.

9. On each sampling occasion the parameters identified in Table 2 will be determined. Those determinations noted * are essential on all occasions; the remainder are recommended.

10. The microbiological analyses of faecal streptococci and *E. coli* should be carried out by the MPN method the first year, during which period efforts should be directed towards a smooth transition to the membrane filtration (MF) method. Specific details such as media and incubation time of the MPN method to be implemented are specified according to the ISO standards ISO 7899-1 for faecal streptococci and ISO 9308-2 for *E. coli*.

    Detailed description of the methods will be contained in the manual.

11. The following methods are agreed on for analysis of physical parameters: air temperature (measured, thermometer), water temperature (measured, thermometer), speed of surface current (estimated., m/sec), direction of surface current (8 compass directions), precipitation (measurement for latest 24 hours from nearest meteorological station), water colouring (code list) and water transparency (measured, Secchi-disc).

    Code lists and methods for measuring the parameters will be contained in the manual.

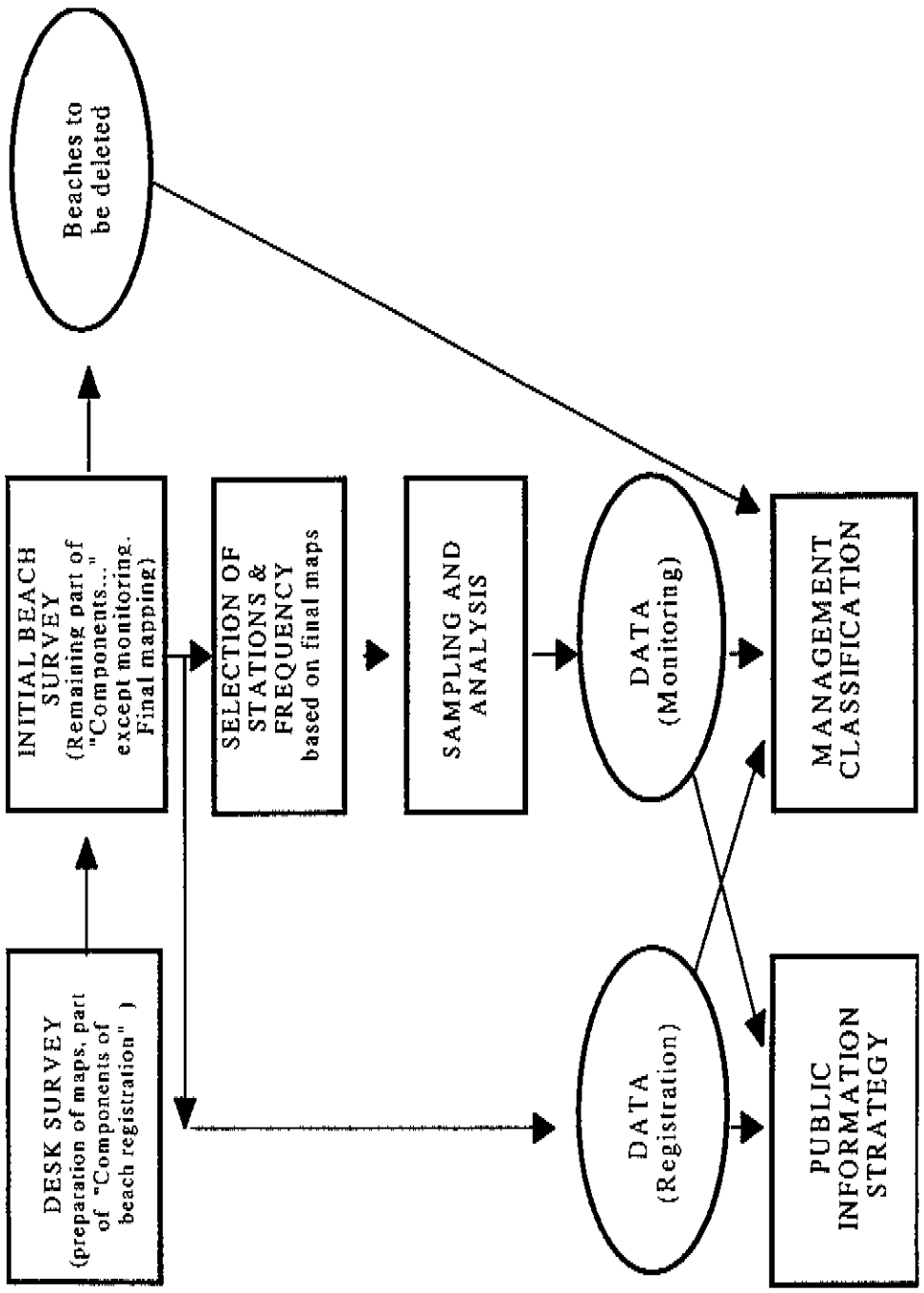

Figure 1. Overall process of development of monitoring

12. Chemical analyses should be carried out as follows: phenols according to ISO 6439: 1990 (spectrophotometric method); BOD_5 according to ISO 5815: 1989 (dilution and seeding method), pH (visual calorimetric method), oil on water (IMO method).

    Code lists and methods for measuring the parameters will be contained in the manual.

13. The following methods were agreed on for visual pollutants: tar on the beach (measured, kg/m^2), foam on the beach (code list), Litter on the beach (measured, kg/m^2) and algae on the beach (code list).

    Code lists and methods for measuring the parameters will be contained in the manual.

14. WHO will provide a review on health impacts of environmental quality aspects associated with bathing water and beach quality to the workshop scheduled for winter 1995/96. At that meeting a technical recommendation will be made to the Black Sea Environmental Programme Steering Committee regarding establishment of standards from a health viewpoint.

    For the purposes of the first year of monitoring activity, the following values were adopted in place of standards as points of reference for assessing water quality compliance:

E. coli	2000/100 ml
faecal streptococci	400/100ml

15. A data management system will be developed, based upon that demonstrated during the workshop for data management purposes and incorporating information regarding beach registration.

16. Data from desk study, initial survey, water quality analysis and beach quality assessment will be used to classify beaches for management purposes into the classes identified in Table 3.

17. The importance of making data available in a useful format to the public was agreed upon. During the first year of monitoring, each participating country will use the collected data according to its national legislation. In preparation for the workshop, the results from this year of monitoring will be compiled into annual reports by each country and discussed. These country reports will be used to compile a single bathing water and beach quality report ("yearbook") for the Black Sea area.

18. A provisional agenda for the review workshop, winter 1995-1996, after the first year of monitoring, is as follows:

Provisional agenda

- Extent of monitoring completed
- Information generated, draft first "yearbook"
- Different strategies adopted in different countries (e.g. centralised/decentralised testing)

- Methods used - problems, solutions, adequacy including:
  - how to handle flat positives from MPN testing
  - how to handle samples that could not be tested (breakage)
  - how to establish a logical relation between sample frequency and number of samples allowed to exceed limit values
  - changes in sample frequency between season

- Discuss and agree upon recommended standards for bathing water and beach quality, agree on strategy to promote these within the legal sector nationally/internationally.

- Review of experience (case studies) with different uses of data in the various countries and elsewhere (for example, enforcement, intersectoral coordination, public information sharing) and discuss future strategy for this.

- Experience with provisional environment and health management classification and revise accordingly.

- Discuss experience with the GIS system and propose refinement and further development.

- Sampling, analytical and data quality control.

Preparation

- In advance of the workshop each country will prepare a report addressing the above issues, to be discussed at the workshop.

- WHO to discuss wider GIS application and provide report (see recommendations of workshop).

- WHO to report back on findings of epidemiological studies (see recommendations of workshop).

Recommendations

1. Further epidemiological information is needed to determine the health impact of bathing water and beach quality and thereby support the development of standards. Further studies should be undertaken with regard to faecal contamination of bathing water.

   WHO should review and publish information concerning the findings of these studies. These should include not only faecal pollution of bathing water, but also other pathogens in water (such as *St. aureus, Ps. aeruginosa*) and chemical contaminants in water; and of health impacts of pollution of beach material (such as sand).

2. WHO should discuss and reach agreement with BSEP PCU regarding the integration of information of land-based sources of pollution into the GIS system.

3. WHO should seek resources, and provide where possible support for training, equipment, laboratory consumables and for a review meeting to support programme implementation.

4. The following developments to the data management/GIS demonstrated at the workshop should be implemented:

- in light of general progress with GIS in the GEF Black Sea Environmental Programme, a coding system should be developed that includes at least the hierarchical levels of country, beach and sampling station

- a data module should be added to contain the "beach registration" data (that is, desk study and initial survey)

- a module should be added to facilitate conversion of degrees/minutes/seconds to UTM coordinates.

Table 3. Environment and health beach classification

Category Subcategory	Description	Criteria	Management Activity
1	Good quality, safe beach	Beach quality consistently good Water quality consistently good Safety facilities per user good	
1-A	Good quality safe, fully used	Regional development/Municipality does not wish to increase tourist numbers	M
1-B	Good quality safe for further development	Regional development/Municipal plans wish to increase tourist numbers	M, see note p
2-A	Safety facilities inadequate good quality beach and water	Safety facilities (per tourist 1000) inadequate Water quality consistently good Beach quality consistently good	M seek improved safety from Municipality (then 1 A/B)
2-B	Safety facilities good, quality of beach and/or water inadequate	Safety facilities (per tourist 1000) inadequate Water quality poor and/or Beach quality poor	M see note 1
3	Safety and quality inadequate	Safety facilities (per tourist 1000) inadequate Beach quality poor and/or Water quality poor	M see note 1
4	Not suitable for tourism	Designated sensitive area and/or intrinsically unsafe (currents etc.)	Discourage/ban Use
5	Beach not used for bathing	no/negligible tourists	Maintain on register periodically re-assess tourist use

I: improvement — where bathing water and beach quality is poor, the monitoring agency should support efforts to identify the cause or source of pollution.
Where the cause appears to require local solution (such as beach cleaning) then the monitoring agency should seek appropriate action from the Municipality and then reclassify the beach accordingly.
Where the cause requires major investment or regional/national decision/making, the monitoring agency should ensure that health concerns are adequately represented.

M: monitoring — routine monitoring of bathing water and beach quality

P: promote — the decision whether to promote (increased) tourist use of a beach or area will depend on local and regional developments plans. The health sector should, in principle, endorse such plans where water and beach quality are good and safety facilities adequate (i.e. category A2, not otherwise), provide information tot he planning authorities, and participate in multi-sectoral planning activities

Annex 1

Working papers*

ICP/CEH 133/2	Scope and purpose
ICP/CEH 133/3	Provisional agenda
ICP/CEH 133/4	Provisional programme
ICP/CEH 133/5	Provisional list of participants
Other working documents	- Draft manual for recreational water and beach quality monitoring and assessment - Evaluation scheme

*Copies can be obtained from the Rome Division of the WHO European Centre for Environment and Health, Via Vincenzo Bona, 67, 00156 Rome, Italy.

Annex 2

Evaluation scheme

A: Facilities and services

Please categorise your opinion on the quality of the following aspects of the facilities and services provided during the workshop.

	Very Inadequate	Inadequate	Adequate	Very Good	Excellent
Transport			*5*	*7*	
Hotel accommodation				*13*	*3*
Teaching facilities (room/chairs/tables)		*1*		*9*	*5*
System of interpretation			*4*	*9*	*1*
Teaching aids (OHPs, flip-charts, blackboard)			*5*	*10*	
Refreshment breaks			*3*	*12*	*1*
Meals			*6*	*6*	*2*

Other comments you may have:

B: Workshop content and teaching

For you, was the average level of the presentations (X):

( ) far too advanced/detailed
(4) too advanced/detailed
(10) about right
(3) too basic/superficial
( ) far too basic/superficial

The workshop included a number of teaching methods, please rank how you would consider the time spent on each

Teaching method	Far too little	Too little	About right	Too much	Far too much
Formal presentations			*13*	*4*	
Discussion			*14*	*3*	
Field visits			*11*	*1*	*5*

Were there any topics not covered during the workshop that should have been included?

1. Analytical methods
2. QA, QC

Were there any subjects that received too little attention during the workshop?

1. Analytical methods
2. Method for faecal Streptococci (2 replies)

Were there any subjects that received too much attention during the workshop?

1. Sampling procedures
2. Criteria and classification of beaches (2 replies)

Were there any topics covered during the workshop that you feel should have been omitted?

1. Method for faecal streptococci (2 replies)
2. EU requirements guidelines and standards

How successful do you feel the workshop has been in achieving its objectives?

To agree on the following	Very incomplete	Incomplete	Adequate	Successful	Very successful
Criteria for selection of participating beaches			*4*	*13*	
Selection of parameters to be monitored			*2*	*15*	
Criteria for selection of sampling stations			*1*	*16*	
Sampling methods			*6*	*11*	
Conservation methods			*6*	*11*	
Transportation methods and rules			*6*	*11*	
Analytical methods		*4*	*8*	*4*	
Standards		*1*	*10*	*5*	*1*
Statistical evaluation		*2*	*7*	*7*	*1*
Data processing and reporting, including elaboration of maps			*3*	*10*	*4*

Do you think the overall length of the workshop was:

( ) far too short
(3) too short
(34) about right
(1) too long
( ) far too long

Do you think the length of the working day during the workshop was :

( ) far too short
( ) too short
(15) about right
(2) too long
( ) far too long

Any further comments you may have:

1. To prepare teaching material more carefully.

2. To temporary advisers paid by WHO: to be better prepared with their lectures and to know that the participants of the workshop are specialists.

3. I wish we could find time to visit some important parts and places of Istanbul with all participants. You know social activities are important to discuss in detail, to know the status of countries between participants. Also it was great to know you - Thank you.

Annex 3

List of participants

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