WORLD HEALTH ORGANIZATION
REGIONAL OFFICE FOR EUROPE

WELTGESUNDHEITSORGANISATION
REGIONALBÜRO FÜR EUROPA

ORGANISATION MONDIALE DE LA SANTÉ
BUREAU RÉGIONAL DE L'EUROPE

ВСЕМИРНАЯ ОРГАНИЗАЦИЯ ЗДРАВООХРАНЕНИЯ
ЕВРОПЕЙСКОЕ РЕГИОНАЛЬНОЕ БЮРО

EUR/ICP/CWS 016
2200v
ORIGINAL: FRENCH

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ASSESSMENT OF THE INTERNATIONAL WATER DECADE IN EUROPE AND HEALTH ASPECTS OF DRINKING-WATER SUPPLIES

Report on a WHO Consultation

Nancy, France
9-13 November 1987

1988

EUR/HFA target 20

TARGET 20

Water pollution

By 1990, all people of the Region should have adequate supplies of safe drinking-water, and by the year 1995 pollution of rivers, lakes and seas should no longer pose a threat to human health.

Index:

DRINKING WATER
WATER QUALITY
WATER SUPPLY
SANITATION
INTERNATIONAL COOPERATION
EUR

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1. Introduction

Following a visit by a delegation from the French ministry responsible for health to the WHO Regional Office for Europe in Copenhagen, it was decided to organize, in France, a meeting on the progress of the International Drinking Water Supply and Sanitation Decade, during which a number of specific issues would be studied.

It was agreed between the French Government and the Regional Office that the meeting should be held at the International Water Centre in Nancy.

At a separate ceremony presided over by Mr Girard, Director-General of Health, representing Mr Seguin, Minister of Social Affairs and Employment, and Mrs Barzach, Minister responsible for health and the family, the International Water Centre was designated as collaborating centre for water supply and sanitation.

The meeting was attended by 15 representatives, who had the opportunity to describe the progress of the Decade, the policies applied and the results attained so far in their countries.

The following points were discussed:

- aims and methods of health action in the framework of the Decade, both on a routine basis and in emergencies (natural disasters, accidental pollution);
- information needed for assessment of the Decade;
- form of presentation of the information and significance of the data provided *vis-à-vis* the information system producing them;
- essential information for making choices in respect of policy on quantitative and qualitative improvements.

The tools needed to ensure a multidisciplinary approach to health policy on water supply and sanitation were stressed once again. The involvement of the community and all partners in the process requires an adequate knowledge of the situation and satisfactory exchange of information among the partners.

The very open discussions that took place, bringing together the views of the participants from countries whose problems were in some cases very diverse, led to a series of recommendations addressed both to international bodies and to governments.

The present report summarizes the presentations on each country, the main point raised by the different speakers and the comments of the participants on the presentations and gives a number of recommendations.

The meeting was opened by Professor Senault, who welcomed the participants on behalf of the sponsoring bodies and local organizers and recalled that several of the targets for health for all developed by WHO concerned environmental health.

Mr Gaillard, Chairman of the International Water Centre (NAN.C.I.E), expressed his appreciation at the designation of that institution as a WHO

collaborating centre; as such, it would promote a policy of dialogue at national level, particularly with the French ministry responsible for health, and at international level with WHO.

Mr Girard, Director-General of Health of France, recalled the measures taken by his country, in line with WHO's policy, in contributing to the Decade and to health for all by the year 2000. Efforts by all the national partners concerned had brought good results, especially with regard to qualitative aspects.

Mr Acheson, on behalf of WHO headquarters, conveyed regrets from Dr Mahler, WHO Director-General, who was unable to attend the meeting owing to other commitments, and thanked NAN.C.I.E. and the French ministry responsible for health for their support of the Decade, for which WHO was providing secretariat services on behalf of the United Nations.

2. International organizations

2.1 World Health Organization (headquarters)

Figures provided by the countries at the end of 1985 showed that the population with access to safe water and adequate sanitation was not very different, in terms of numbers of people, from the estimate made in 1981 at the start of the Decade. Thus, it might seem that the efforts made have merely served to keep pace with the population growth.

Considerable progress has, however, been made in terms of awareness of the importance of the Decade and of political choices by countries in giving priority to water supply and sanitation. The essential collaboration by the community seems now to be assured at all levels of project development. Efforts made by all concerned, especially the World Bank and the United Nations Development Programme (UNDP), in developing appropriate technology have been an important factor.

In the last few years, experience gained at the beginning of the Decade has made it possible to harmonize programmes and speed up their implementation, and to promote the development and mobilization of human resources. Considerable efforts will still be necessary in suburban and rural areas.

United Nations agencies and external financing institutions have already started to give thought to the post-Decade situation, and a recent meeting in Interlaken, Switzerland, bringing together all partners, set phases for the drafting of a document on the aims, plans of work, timetable and financial needs of a future international council of these agencies and institutions.

Attention was drawn to certain important aspects of the future programme of the Decade:

- development of human and institutional resources;
- cost analysis;
- harmonious development of urban and rural activities;
- installation, maintenance and rehabilitation of facilities;
- community participation and health education;
- coordination and cooperation.

WHO was approached with a view to providing the secretariat for the international council, in view of its experience as secretariat for the Decade. It will continue and step up the work already started. Finally, the development of a data base on assistance and programmes (CESI) represents an important contribution by WHO to all the partners involved in programmes relating to water supply and sanitation.

2.2 World Bank

The World Bank supports and contributes to the achievement of the Decade objectives in various ways.

The main contribution is in the form of financial and technical assistance to a large number of developing countries, which enables them to carry out water supply and sanitation projects. This financial assistance has been growing steadily and at present amounts to about US $1000 million a year. It is provided to countries in four continents: Asia, Africa, South America and Europe.

As regards participation by the World Bank in programmes in European countries, the assistance has been given since the start of the Decade to Greece, Portugal, Turkey and Yugoslavia.

The Bank's assistance strategy does not only provide for financial aid but also seeks to attain broader objectives, targeted on:

- strengthening of national institutions responsible for operational work in the field of water supply and sanitation;
- promotion of operating procedures that allow recovery of capital invested;
- optimization of installation and operating procedures so as to minimize costs and achieve maximum efficiency;
- promotion of systems that can be implemented in the field of water supply and sanitation, in accordance with national priorities;
- promotion of projects that can satisfy the minimum needs of low-income population groups;
- preservation of the quality of the environment by protecting groundwater and surface water resources;
- promotion of sound strategies to allow conservation of water resources and reuse of wastewater.

The Bank also works with United Nations bodies (WHO, UNDP, United Nations Environment Programme (UNEP), etc.) and bilateral assistance agencies in developing low-cost appropriate technology. It is also active in promoting programmes for development of the human resources needed to carry out the Decade work.

2.3 Office of the United Nations Disaster Relief Coordinator (UNDRO)

Rapid intervention following disasters can save lives. In many cases, the authorities can take the necessary action themselves, but sometimes they may also seek external help.

In such cases, the need for assistance must be assessed, the international activities coordinated and possible donors contacted.

When donations in cash or kind are received in response to the appeal, someone must take action to avoid duplication of work and wastage, and to act as guarantor *vis-à-vis* the donors for the proper delivery of the supplies.

The aid must be distributed to the recipients in good time.

The humanitarian role of UNDRO consists of mobilizing aid and ensuring coordination and communications in disasters.

UNDRO began work in 1972 and has since organized more than 380 interventions in connection with major disasters.

UNDRO has resources in funds but also some in kind.

UNDRO's present budget is around US $5.2 million. A rolling fund of US $1 million allows rapid action without waiting for the release of funds that have been promised.

Some of UNDRO's activities are also concerned with the prevention of disasters.

UNDRO has a staff of 56 and a storage depot in Pisa, Italy, and also keeps a computerized list of consultants.

3. WHO collaborating centres

3.1 Centre for Research on Farm Mechanization, Agricultural Engineering, Water and Forests (CEMAGREF), Lyon, France

CEMAGREF has been a WHO collaborating centre for rural sanitation and waste disposal since 1984. The Regional Office for Europe and the Division of Water Quality, Fisheries and Aquaculture have jointly drawn up a four-year programme focusing on natural lagoons. Because of its specifically rural nature, this technique meets the needs of rural dwellers, but can also be suitable for dealing with the sanitation problems of tourist areas (variable load).

In addition to carrying out expert missions and receiving foreign visitors requiring information, CEMAGREF has organized a working group on the subject of treatment of wastewater by natural lagoons (attended by 32 participants from 12 countries and 5 international bodies). The conclusions took the form of three recommendations to WHO concerning the establishment of an information network on lagoon treatment, training of staff, and translation into English and distribution of a paper on the design and management of waste treatment lagoons.

The following material was issued following the meeting:

- a report on lagoon treatment in the Mediterranean region;
- a technical report on lagoon treatment;
- translations of the above.

This material could provide a basis for training staff responsible for planning and sanitation.

3.2 International Water Centre (NAN.C.I.E.), Nancy, France

The Nancy area has a considerable scientific, technological and industrial potential with regard to water supply and sanitation:

- more than 300 researchers, academics and public health engineers;
- an urban centre with advanced facilities for water supply, waste disposal, sludge treatment and reuse of waste;
- the presence of industrial groups and professional workers in the field of water supply in France.

NAN.C.I.E. was created as a result of a political decision to bring all these resources into a single federation and to propose multisectoral action on research, training, education and technology transfer.

In less than three years, NAN.C.I.E. has been able:

- to develop a programme of result-oriented research worth around FF 15 million;
- to organize international training courses;
- to patent and test several procedures, one of which, a new technique for biological treatment of effluent, is now being marketed;
- to carry out several expert missions abroad involving transfer of know-how;
- to develop a close network of international relations.

For these reasons, WHO has taken an interest especially in the level and quality of the sanitary teams in NAN.C.I.E., which have built up skills and a reputation in the field of water supply.

Following studies by NAN.C.I.E. and its staff since 1985, the Regional Office and the centre signed a protocol of collaboration on 9 November 1987, on the occasion of the seminar on the assessment of the International Water Decade in Europe and the sanitary approach to water supply, held in Nancy from 9 to 13 November 1987.

This protocol provides for a four-year plan of work dealing with:

- recreational waters: quality control;
- bottled water;
- balneology;
- recreational areas: monitoring of water and sanitation;
- sanitation in arid regions;
- analysis of needs for human resources;
- protection of drinking-water supplies and sanitation in disasters.

The collaborating centre will also play a major role in collecting and processing information on the Decade so that it can be evaluated.

Since 1 January 1988, a permanent team will carry out these tasks in coordination with the bodies involved at national level, particularly services of the ministry responsible for health, and at international level.

3.3 International Reference Centre for Community Water Supply and Sanitation (IRC), The Hague, Netherlands

The main function of this collaborating centre is to develop programmes to promote the collection, transfer and use of information.

IRC plays an advocacy role in promoting new techniques and methods that have already been tested in the field of water supply and sanitation in developing countries.

This action focuses on:

- community participation;
- health education;
- financial management;
- maintenance and operation;
- training and development of human resources;
- evaluation and application of appropriate technology (slow sand filtration, public standposts, etc.).

Last year, the International Action Committee for the Decade took note of the efforts by IRC in the way of dissemination of information and approved its proposed plan of action.

A workshop (June 1987) and international meeting (October 1987) were organized on the topic of exchange of technical knowledge.

Materials developed by the centre include:

- an international water thesaurus (English/French/Spanish);
- a catalogue of existing information and documentation sources.

The presentation by the IRC participant was accompanied by the projection of slides illustrating the Centre's activities in developing countries.

3.4 Water Research Centre (WRC), Medmenham, United Kingdom

WRC was designated as collaborating centre for research on drinking-water and pollution control in 1980. Its services have been sought on many occasions by WHO headquarters and regional offices, although the closest cooperation has been with the Regional Office for Europe. WRC's principal activities in 1987 were as follows.

- Participation in the working group on removal of organic and inorganic micropollutants from drinking-water sources (Siofok, Hungary, 15-18 September 1987). A staff member of WRC's Stevenage laboratory acted as rapporteur for the meeting and presented the views of the United Kingdom.

- Water quality monitoring in Morocco, involving technology transfer between the National Water Supply Agency in Rabat and WRC, under WHO auspices. Several consultations dealing with nitrates, the development of toxicological tests and technology transfer also took place.

- Revision of the WHO drinking-water quality guidelines. The preface to the second volume stated that the guidelines would be updated periodically to reflect advances in knowledge. This has proved particularly necessary for certain organic compounds, on which there was only limited information when the guidelines were drafted. In this connection, WRC and WHO organized a consultation on potentially toxic microsubstances in drinking-water, at Medmenham from 11 to 14 May 1987; high priority was given to 12 of the 29 pesticides that are due to be studied.

- Participation in the world conference on chemical accidents, organized by WHO in Rome from 11 to 14 May 1987; WRC presented two reports on this occasion.

3.5 Research Centre for Water Resources Development (VITUKI), Budapest, Hungary

VITUKI was designated as a collaborating centre for the Regional Office in 1983. However, collaboration between WHO and VITUKI had already started in the 1960s, with the organization of conferences and expert missions in the field of pollution control and with the implementation of UNDP-financed projects in Hungary.

The agreement was renewed in 1986, with similar provisions. Since 1983, VITUKI has organized the following working groups:

- bankwell filtration, Budapest, 1984;
- removal of nitrates from drinking-water, Budapest, 1986;
- removal of micropollutants from drinking-water, Siofok, 1987.

In addition, VITUKI has played an important role in the preparation of a WHO/UNDP intercountry project for protection of water quality in the river Danube, and it is hoped that it will be able to give valuable assistance in the implementation of the project. VITUKI is also responsible for management of a WHO/UNDP national project on bankwell filtration for protection of the river Danube.

Another important input in this collaboration relates to the facilities for training staff in water resources management that VITUKI makes available to WHO Member States in Europe.

4. Assessment of the International Water Decade in Europe

4.1 Regional situation

The WHO programme for the Decade was presented by the officer responsible for this activity at the Regional Office. He described the goals of the programme and the activities needed to achieve them, and noted that the programme should focus on the following priorities in the next few years:

- investigating the effects on human health of the presence of organic and inorganic micropollutants in drinking-water and recreational waters:

- promoting the protection of drinking-water resources;

- promoting the establishment of national networks to ensure regular monitoring of water quality and enable action to be taken in good time in cases of accidental pollution at national or international level;

- assisting countries of the Region in the implementation of national or international projects supported by United Nations agencies (WHO, UNDP, UNEP/WHO, etc.);

- promoting policies and strategies for conserving water resources (reuse of sewage and industrial wastewater, rehabilitation of contaminated sources, supply systems, etc.).

It was also pointed out that the main problems in the programme were the lack of an information system appropriate to the needs of the Region and difficulties in obtaining information from certain Member States.

4.2 Country situation

4.2.1 Czechoslovakia

Latest demographic data

Total population: 15 503 426
Urban population: 7 782 720 (50.2%)
Rural population: 7 720 706 (49.8%)

Data relevant to the Decade

Type of service		Population served	Coverage (%)
Piped water in the home	(urban)	6 926 621	89.00
	(rural)	2 779 454	36.00
Connection to a sewage system	(urban)	5 790 344	74.40
	(rural)	3 909 766	50.64
Other adequate sanitary facilities	(rural)	3 810 940	49.36

The Czechoslovakian participant in the meeting drew attention to the following points.

The first water supply systems in Czechoslovakia were built at the end of the nineteenth century. In 1949, the authorities started to regroup smaller systems into larger ones, and today there are 3163 systems serving 12 million people, either in the home or through public standposts. Some 63% of the population have piped water in their homes, and 50% of the supplies are derived from surface water. As far as sanitation is concerned, 9.7 million people (62.9% of the population) are served by main sewerage.

The Prague treatment plant was built in 1970. Since 1981, the construction of treatment plants has been a priority under the national plan, and as a result towns and industries have started to treat their wastewater.

Since the beginning of the Decade, good results have been achieved. For instance:

- length of the water supply system: 1980, 50 000 km; 1986, 61 000 km;
- number of people served by the sewer system: 1980, 8.1 million; 1986, 9.7 million.

The system for quality control of the water is the same throughout the country and is centralized. The main problem faced by the country continues to be protection of water resourses.

4.2.2 Finland

Latest demographic data

Total population: 4 890 000
Urban population: 2 934 000 (60%)
Rural population: 1 956 000 (40%)

Data relevant to the Decade

Type of service		Population served	Coverage (%)
Piped water in the home	(urban)	2 816 640	96
	(rural)	1 369 200	70
Connection to a sewage system	(urban)	2 669 940	91
	(rural)	913 320	47
Other adequate sanitary facilities	(rural)	1 042 680	53

The Finnish participant in the meeting drew attention to the following points.

The objective adopted by the national committee for the Decade provides for research into:

- drinking-water supply in urban and rural areas;
- quality control of drinking-water;
- sanitation in urban and rural areas;
- staff training;
- public information.

The national policy has the following main objectives:

- to maintain the quality of drinking-water resources for populations not served by a public system;
- to improve water quality in certain towns facing special problems in using optimum sources of raw water or in applying the most effective treatment methods;
- to prevent pollution;
- to improve the quality of raw water.

To achieve these objectives, further, more specialized training is needed for the staff working in this field, and provision for such training is made in the Decade programme.

4.2.3 France

Latest demographic data

Total population: 55 173 000
Urban population: 32 552 000 (59%)
Rural population: 22 621 000 (41%)

Data relevant to the Decade

Type of service		Population served	Coverage (%)
Piped water in the home	(urban)	32 552 000	100
	(rural)	21 489 950	95
Connection to a sewage system	(urban)	32 552 000	100
	(rural)	14 251 230	63
Other adequate sanitary facilities	(rural)	8 369 770	37

The French participant drew attention to the following points.

Virtually all people in France are served by public water supply systems.

The systems must comply with various hygiene rules and quality criteria, which take into account the recommendations of WHO and directives of the European Community.

Although the water supplies are potable in most cases, there are a number of health problems. From the microbiological standpoint, the minor epidemics that do occur are due to noncompliance with sanitary regulations and are rapidly brought under control.

In small water supply systems, it is difficult to comply with the microbiological quality criteria consistently; epidemiological surveys are carried out to study the actual effect of this on health.

From the chemical point of view, the main problems concern accidental pollution, the presence of lead in the supplies owing to lead plumbing, the concentration of nitrates in some groundwater, the presence in piped water of chemicals produced by treatment (aluminium, chlorinated compounds, etc.), and contamination of groundwater resources from compounds such as pesticides.

With regard to sanitation, major efforts have been made:

- to build sewage treatment plants;
- to assist the plant operators;
- to improve the efficiency of household treatment devices.

Sanitary monitoring is carried out in seawater and fresh water used for bathing.

Coordination of the different partners involved in the production of water supplies is promoted through appropriate procedures but also through information activities.

4.2.4 Greece

Latest demographic data

Total population: 9 789 000
Urban population: 6 822 933 (69.7%)
Rural population: 2 966 067 (30.3%)

Data relevant to the Decade

Type of service		Population served	Coverage (%)
Piped water in the home	(urban)	6 208 869	91
	(rural)	2 165 229	73
Connection to a sewage system	(urban)	4 093 760	60
	(rural)	1 779 640	60
Other adequate sanitary facilities	(rural)	1 186 427	40

In his report on the situation in his country, the participant from Greece drew attention to the following points.

In its activities in the field of water supply and sanitation, the Ministry of Health uses the expertise of doctors, sanitary engineers and public health inspectors.

Adequately trained staff are available; they are trained in the country free of charge but are not currently employed owing to budgetary restrictions.

There is an infrastructure of laboratories to carry out the necessary tests for quality control of the water, but it should be strengthened.

To check quality criteria for drinking-water, Greece has been using the European Community norms since 1986. There are also national norms on recreational waters that can be strengthened by the prefectural authorities.

The problems encountered most frequently relate to microbiological quality (contamination of resources, irregular supplies, age of the systems and inadequate disinfection).

The remedial action taken is of a short-term nature. Preventive measures should be strengthened.

With regard to information, reports prepared by laboratories are sent to the Ministry of Health, which then informs the local authorities about the remedial action to be taken. In addition, it prepares an overall analysis of the data collected. The universities could also assist in this action.

To deal with emergencies (earthquakes), a master plan giving the authority for decision-making to the central level has been prepared.

It is planned to give a certain leeway for action to the local authorities, at least during the first 36 hours. This initiative should be continued with a view to greater involvement at local level.

Finally, seasonal migrations of the population (tourism) cause difficulties in the management of water supplies (quantity and quality).

4.2.5 Hungary

Latest demographic data

Total population: 10 657 000
Urban population: 6 010 548 (56.4%)
Rural population: 4 646 452 (43.6%)

Data relevant to the Decade

Type of service		Population served	Coverage (%)
Piped water in the home	(urban)	5 499 651	91.5
	(rural)	3 452 314	74.3
Connection to a sewage system	(urban)	4 507 911	75.0
	(rural)	185 858	4.0
Other adequate sanitary facilities	(rural)	3 949 484	85.0

The Hungarian participant in the meeting drew attention to the following points.

Hungary was one of the first countries in the Region to establish a national committee for the Decade. The medium-term (five-year) development plans have been brought into line with the Decade objectives, giving priority to expansion of the existing water supply systems. Development of sanitary facilities has been intensified in the last few years.

The Decade objectives have been adapted to social needs, priorities have been established, and interdisciplinary and coordinated action by the different administrations has been promoted. Action by local committees has been encouraged with a view to involving the population in decision-making and management with regard to sanitary facilities, and over 300 associations have been set up for this purpose.

Finally, Hungary has initiated and supported moves to achieve international cooperation for pollution control. An agreement on protection of the river Danube has been signed by eight countries.

4.2.6 Iceland

Latest demographic data

Total population: 240 000
Urban population: 215 040 (89.6%)
Rural population: 24 960 (10.4%)

Data relevant to the Decade

Type of service		Population served	Coverage (%)
Piped water in the home	(urban)	215 040	100
	(rural)	24 960	100
Connection to a sewage system	(urban)	215 040	100
	(rural)	12 480	50
Other adequate sanitary facilities	(rural)	12 480	50

The Icelandic participant in the meeting drew attention to the following points.

To start with, it should be noted that public drinking-water supply poses no problems in Iceland from the point of view both of quality or of quantity.

Iceland has one of the highest rainfalls in Europe, and direct evaporation is minimal owing to the relatively low average temperature of the country throughout the year, which is between 4°C and 10°C.

Moreover, Iceland has a low population density, few polluting industries, and numerous glaciers supplying very high-quality water to the rivers.

The centralized organization of the monitoring services also plays a role. They are under the responsibility of physicians, who have the status public health officers and exercise considerable powers to take action to deal with any problems, backed by legislation that gives them the monopoly in this field.

One problem faced at present is the arrival in Iceland of itinerant tourists, who cause pollution of water resources.

Steps must be taken to organize and restrict this type of tourism so as to safeguard the present quality of surface water and groundwater in Iceland.

4.2.7 Italy

Latest demographic data

Total population: 56 742 000
Urban population: 40 854 000 (72%)
Rural population: 15 888 000 (28%)

Data relevant to the Decade

Type of service		Population served	Coverage (%)
Piped water in the home	(urban)	40 854 000	100
	(rural)	15 252 480	96
Connection to a sewage system	(urban)	40 854 000	100
	(rural)	11 121 600	70
Other adequate sanitary facilities	(rural)	4 766 400	30

The Italian participant in the meeting drew attention to the following points.

Italy has had a master plan for aqueducts since 1967. Its aim is to improve the availability of water resources. Its provisions vary considerably between areas in the north and those in the south, where resources are unstable, with the possibility of shortages.

Some 90% of the drinking-water resources are derived from wells and springs, with an average consumption of 126 litres/person/day and an estimated future average consumption of 200-220 litres/person/day. Water quality is generally satisfactory *vis-à-vis* the EEC norms, which have been applied in the Italian legislation since 1985.

There are, however, some pollution problems owing to the presence of nitrates (horticultural areas along the Adriatic Coast, shallow wells in Sardinia), herbicides (intensely farmed Po Valley in Lombardy) and chlorinated solvents in the industrial areas of cities (concentrations ranging from 50 g/l to as much as 300 g/l).

The plan has been supplemented since 1977 by the regional administrations, which have been able to adapt it to local conditions.

The main thrusts of the policy on water supply are as follows:

- priority use of groundwater for human requirements and of surface water for industrial and agricultural requirements;
- diversification of water sources so as to be able to deal with accidental pollution;
- interconnection of supply systems to ensure optimum distribution;
- promotion of system management associations so as to optimize investment and operating expenditure.

The participant from Italy stressed the need, as far as administration is concerned, to pool the expertise of the different ministries dealing with the problems of water supply.

4.2.8 Malta

Latest demographic data

Total population: 331 997
Urban population: 249 000 (75%)
Rural population: 83 000 (25%)

Data relevant to the Decade

Type of service		Population served	Coverage (%)
Piped water in the home	(urban)	249 000	100
	(rural)	79 680	96
Connection to a sewage system	(urban)	236 550	95
	(rural)	69 720	84
Other adequate sanitary facilities	(rural)	13 280	16

The Maltese participant in the meeting drew attention to the following points.

The main economic activity is agriculture, but tourism and naval dockyards also play a role. The climate is semi-arid.

Drinking-water is derived from groundwater resources. However, a growing concentration of nitrates from agriculture in the north and a rise in chlorine rates from the entry of saline water into the aquifers in the south are limiting the use of this resource.

Three desalination plants produce about seven million gallons a day; the water produced in this way is mixed with groundwater before distribution.

To limit demand, industrial users are encouraged to recycle wastewater, and national campaigns are conducted to promote economies and storage of rainwater.

4.2.9 Netherlands

Latest demographic data

Total population: 14 453 833
Urban population: 12 719 373 (88%)
Rural population: 1 734 460 (12%)

Data relevant to the Decade

Type of service		Population served	Coverage (%)
Piped water in the home	(urban)	12 693 934	99.8
	(rural)	1 647 737	95.0
Connection to a sewage system	(urban)	12 693 934	99.8
	(rural)	312 203	18.0
Other adequate sanitary facilities	(rural)	1 422 257	82.0

The Netherlands participant in the meeting drew attention to the following points.

The country has a population of 14 million distributed over 44 548 km^2, carries out intensive agriculture, and contains the estuaries of the Rhine and Meuse rivers.

A total of 86 plants distribute water to 99% of the population. The main problems encountered are the presence of nitrates, heavy metals, pesticides

and oil products. For example, 240 kg/ha of nitrogen fertilizer are applied to the land each year, and 20 million kg of active pesticide products are used (10 kg/ha).

Research is being carried out to develop new types of cereal that require fewer phytosanitary chemicals. The law of 1982 on pesticides regulates the import and use of such products, while the law on soil protection stipulates that the soil must both have the capacity to store good-quality water and be of adequate quality for agriculture. To comply with these laws, efforts are being made to reduce the application of nitrates, phosphates and liquid manure. However, there is a relatively long time lag between the promulgation of the law, its implementation and practical results.

The aim of the Netherlands authorities is to obtain raw water that does not require treatment for removal of nitrates and pesticides, since the present situation is considered unsatisfactory and temporary.

4.2.10 Poland

Latest demographic data

Total population: 37 114 000
Urban population: 22 331 493 (60.17%)
Rural population: 14 782 506 (39.83%)

Data relevant to the Decade

Type of service		Population served	Coverage (%)
Piped water in the home	(urban)	19 785 702	88.6
	(rural)	8 869 504	60.0
Connection to a sewage system	(urban)	17 641 879	79.0
	(rural)	916 515	6.2
Other adequate sanitary facilities	(rural)	13 865 990	93.8

The Polish participant in the meeting drew attention to the following points.

Drinking-water is derived in equal proportions from groundwater and surface water resources.

In 1960, the country was still suffering from the effects of war damage, and only a relatively small proportion of the population benefited from services:

- 30% of dwellings had piped water;
- 14% of dwellings had a bathroom.

The rates were 55% and 20% respectively for urban areas and 37% for rural areas.

At the start of the Decade, the proportion of dwellings with facilities had risen to 69% with regard to water supply and 55% with regard to bathrooms. These levels were still inadequate. Moreover, there was an increasing gap between the figures for urban and rural areas. This was due to extensive migration to the towns as a result of industrialization, accompanied by the construction of new housing with full facilities, whereas in rural areas improvements could only be achieved by upgrading existing facilities, which is a slower and more complicated process.

Despite a difficult economic situation, substantial progress was made during the first five years of the Decade. Up to the end of 1985, the proportion of dwellings with piped water was 89% in urban areas and 60% in rural areas.

In fact, the piped water supply system grew by 20%.

Construction is financed from state funds allocated to the local authorities following approval of their plans. While farmers pay for some of the cost of the systems in accordance with their incomes, the whole cost is borne by the state in urban areas. Generally speaking, the water rate is far below the real cost, and it will be increased for both domestic and industrial users to enable continued expansion and modernization of the system, particularly in rural areas.

4.2.11 Portugal

Latest demographic data

Total population: 9 833 014
Urban population: 4 228 196 (43%)
Rural population: 5 604 818 (57%)

Data relevant to the Decade

Type of service		Population served	Coverage (%)
Piped water in the home	(urban)	4 101 350	97
	(rural)	2 802 409	50
Connection to a sewage system	(urban)	3 509 403	83
	(rural)	504 434	9
Other adequate sanitary facilities	(rural)	5 100 384	91

The Portuguese participant in the meeting drew attention to the following points.

In 1982, a master plan for the Decade was drawn up with the following objectives:

- to cover more of the country by systems of water supply, waste disposal and treatment and refuse collection;
- to harmonize the sanitation policy with the general health and environmental policy;
- to promote coordination between services at different levels;
- to rationalize the operation and management of services;
- to step up staff training.

The local authorities are responsible for management and operation of the systems for water supply, wastewater disposal and refuse collection.

In recent years, major institutional restructuration has taken place, particularly at the central level, with regard to relationships with the bodies dealing with water supply and sanitation.

Since 1980, financial and recruitments efforts have been made to improve sanitary conditions in the country and have given very good results.

A national water law is being prepared, which will provide for quality control of drinking-water, recreational waters and effluents. Up to now, the WHO recommendations and EEC directives have been used as a regulatory framework.

4.2.12 Spain

Latest demographic data

Total population: 39 300 000
Urban population: 27 510 000 (70%)
Rural population: 11 790 000 (30%)

Data relevant to the Decade

Type of service		Population served	Coverage (%)
Piped water in the home	(urban)	24 759 000	90
	(rural)	5 895 000	50
Connection to a sewage system	(urban)	22 008 000	80
	(rural)	4 716 000	40
Other adequate sanitary facilities	(rural)	7 074 000	60

The participant from Spain also drew attention to the following points.

Overall, 80% of the population are served by water supply systems.

The situation with regard to sanitation is more difficult to assess.

A national committee for the Decade has not been set up in Spain, since equivalent structures already exist.

These structures are totally decentralized, and each region or province of Spain is autonomous, enabling it to manage its own water resources and to build and operate wastewater disposal systems.

The central authorities in Madrid have prepared a technical guide for assessment of the environmental situation in Spain. Most of the provinces in the country have been using the guide and thus been able to carry out surveys currently producing very accurate data on the situation in respect of all aspects of the environment (air, soil, water and the physicosocial environment).

With regard to water supply and sanitation, the collected data have provided a basis for drawing up plans of action to solve the problems identified: insufficient capacity for sewage treatment, inadequate treatment of wastewater, pollution of surface water and groundwater resources, etc.

Regional programmes for improving water supply and sanitation services are being implemented and are regularly evaluated.

The regional structure of the country poses some difficulties for preparing national statistics.

4.2.13 Sweden

Latest demographic data

Total population: 8 331 000
Urban population: 6 914 730 (83%)
Rural population: 1 416 270 (17%)

Data relevant to the Decade

Type of service		Population served	Coverage (%)
Piped water in the home	(urban)	6 914 730	100
	(rural)	1 345 457	75
Connection to a sewage system	(urban)	1 062 203	100
	(rural)	254 929	18
Other adequate sanitary facilities	(rural)	1 161 341	82

The Swedish participant in the meeting drew attention to the following points.

In accordance with Swedish legislation, drinking-water quality is monitored both at the water supply plant and at the point of delivery in the consumer's home. The results are made public.

Coliforms are found in 3% of samples, making the water unfit for consumption; this occurs particularly in small systems.

The contamination appears to be due to inadequate protection of groundwater and surface water, to seepage between sewer and water supply systems, and to bio-regeneration in the supply systems.

In cases of accidental pollution, the local authorities draw up emergency plans and send in teams.

Finally, some complaints about deterioration of the organoleptic quality of water in the supply systems have been noted.

In 1967, a serious epidemic (3500-6000 cases) was reported in the press, although it was not possible to investigate it. In the ensuring ten years, a system for monitoring of waterborne gastroenteritis has gradually been established, making it possible to identify from two at the outset to a dozen epidemics each year, affecting up to 3000 people in each case. Certain etiological agents have been found in the water supplies (*Campylobacter*, *Salmonella*, *Shigella*, *Giardia lamblia*, *Entamoeba histolytica*), making it possible to establish a link between wastewater and water supplies, then to carry out routine preventive surveys.

It may be concluded that adequate prevention of waterborne diseases involves:

- monitoring of the quality of water supplies and the health of the population *vis-à-vis* the water hazard;

- systematic identification of risk factors in the environment, followed by protection measures.

4.2.14 Turkey

Latest demographic data

Total population: 51 090 000
Urban population: 26 413 530 (51.7%)
Rural population: 24 676 470 (48.3%)

Data relevant to the Decade

Type of service		Population served	Coverage (%)
Piped water in the home	(urban)	19 229 049	72.8
	(rural)	16 039 705	65.0
Connection to a sewage system	(urban)	18 225 335	69.0
	(rural)	4 935 294	20.0
Other adequate sanitary facilities	(rural)	17 273 529	70.0

The Turkish participant in the meeting drew attention to the following points.

The proportion of public investment funds allocated to water supply and sanitation has grown steadily since 1980, as follows: 3.22% in 1981, 3.32% in 1982, 3.83% in 1983, 4.00% in 1984, 5.56% in 1985 and 7.64% in 1986. The estimate for 1987 is 7.9%.

In the period 1987-1993, studies will be undertaken in approximately 30 000 locations in rural areas and in 791 urban districts. The requirements of 18 of the largest towns (over 100 000 population) will be met by the year 2020, and sanitation schemes for 210 municipalities will be completed.

It is clear that the process of urbanization will continue, that the needs will increase, and that new investment will be necessary for the maintenance, renovation and repair of facilities.

The main problems in this field are:

- shortage of water supply and sanitation facilities owing to the rapid increase in the urban population;
- lack of appropriate arrangements for repair, maintenance and operation of facilities;
- lack of trained staff and modern management techniques;
- insufficient financing (the most important problem).

Bearing in mind the priority needs for meeting the water requirements of urban areas from surface water, the emphasis in accordance with the objectives of the plan is on developing regulatory and administrative measures to monitor and prevent pollution of surface water. Systematic monitoring of water quality has been undertaken since 1979.

There is a need to encourage local production of different types of equipment and material and to develop appropriate technology fully adapted to local needs.

The overall aim of the Decade programme in Turkey is to catch up in meeting the immediate needs of the population for water supply and sanitation. By the end of the Decade, the authorities hope to have solved most of these problems and to be able to meet the future needs on a planned basis.

5. A sanitary approach to water supply

A sanitary approach to water supply involves taking a number of factors into account: legal, technical, historic and organizational. During the discussions, emphasis was given to different aspects: on the one hand, general problems related to management and research and, on the other, the technical aspects of water supply and quality criteria.

Each topic was dealt with in the same way: in the light of the reports on the situation in one or more countries, discussion took place with a view to comparing the different situations and experiences of the countries.

5.1 Management

In France, the Government lays down the national policy on water supply management, and the Ministry of the Environment is charged with promoting this policy. However, there is no single public or private body responsible for carrying out the management.

France is a in a relatively better situation than its European neighbours as regards water quantities (4000 m^3/year/person), but this relative abundance does not mean that there are no problems; these include regional and seasonal disparities, considerable increases in certain forms of water use (cooling), pollution of all kinds (bacteriological, chemical, both regular and accidental), and changing needs of the population for water (recreation, fishing, etc.).

Numerous partners are involved in water management, the most important being the local authorities and specialized institutions set up by the law of 1964 (water management committees and financing agencies). Coordination is ensured both at the central level (interministerial water commission, national water committee) and in the departments and regions of the country.

The state is responsible for developing legislation and deals with the technical and financial aspects of the application of certain regulations. In all other cases, the state's role is limited to planning the acquisition of knowledge about resources and motivating all partners in the process of water management.

The present legal framework is being studied so as to simplify it, regroup the partners involved and adapt it to changes in society. A major debate is going on that should lead to new regulations that are both more homogeneous and better adapted to the needs.

The debate has focused on the problems of transborder measures and international management of large river basins. There can, of course, be many different types of management within a given country; sometimes there is a river basin with a highly independent authority, and sometimes such bodies merely promote consensus and carry out research or finance operations of common interest, as in France for instance.

At the present time, therefore, it would seem difficult to establish a joint management system at international level; the idea has been explored for the Rhine river basin, but the only structures created so far are international consultative bodies such as the Rhine commission or the Lake Leman commission. These bodies make recommendations to countries.

5.2 Research

Research on water supply in France is concerned more with quality considerations than with quantity, focusing on optimum ways of managing this resource, and the satisfaction of health and economic needs while seeking to improve quality.

The research involves numerous partners, who generally work on an interdisciplinary basis.

The research is financed both by the authorities and by the private sector in view of the important role of the latter in water supply and its concern to meet the needs of consumers as well as possible.

Numerous partners are involved in the research, including universities (grouped together in associations), private groups and some private or parastatal centres.

The main topics of the research can be grouped under the following headings:

- quality control and monitoring;
- water quality in the natural environment;
- treatment technology in terms both of new procedures and of better monitoring of facilities;
- variation in water quality during distribution;
- impact of water quality on health (epidemiology).

Because of what is at stake, the number and diversity of partners involved, and the commitment of the authorities in the private sector, research on water supply in France is unquestionably dynamic and encompasses numerous fields, some of which are particularly innovative.

There was a short discussion following a question about research into asbestos cement systems. Some studies, incidentally extremely costly, have shown slight traces of asbestos in the water conveyed in these systems, especially when the water is aggressive. However, a number of publications, mainly Canadian, tend to show that this poses no health risk to consumers.

5.3 Distribution systems

In discussing distribution systems, the participants considered in turn the case of large systems and of small systems, particularly in France.

5.3.1 Large systems

The quality of water entering the systems, the nature of the materials in contact with the water and, finally, the hydraulics of the systems are the three main factors accounting for variations in water quality during distribution.

These variations in quality affect the biological characteristics (bacterial multiplication, appearance of higher organisms), chemical characteristics (dissolved oxygen, nitrogen compounds, certain organic derivatives, certain metals) and organoleptic characteristics.

The most important remedial measures that can be taken to reduce these disadvantages are the following:

- reducing the organic load on the water as far as possible;
- reducing the bacterial load;
- managing the use of oxidants in an appropriate way;
- providing for continuous monitoring of certain characteristics;
- ensuring vigilance as regards the materials used;
- ensuring adequate hydraulics within the system;
- making provision for maintenance of the system.

Solutions must often be found to the problems of variations in water quality in large systems. However, it is possible to limit these problems by paying particular attention to certain key aspects.

5.3.2 Small systems

A study by the Directorate-General of Health on public water supplies, carried out in France in 1979, 1980 and 1981, revealed that a number of analyses did not meet the regulatory requirements for microbiology. These problems occur almost exclusively in systems serving very small communities, in rural and especially mountain areas.

Because resources are scattered and are often at a distance from the point where they are used, and because of the fact that it is impossible in practice to protect multiple low-volume water catchments effectively, it is unrealistic to carry out preventive measures.

Remedial treatment is difficult to apply: chlorination, the usual method, is not well accepted by consumers because of the resulting changes in organoleptic qualities.

In addition, chlorination is often ineffective because financial and technical resources of small communities do not allow the use of self-adjusting chlorinators that deliver the correct amount of chlorine, which can vary considerably.

In addition, chlorination is not considered necessary by users. Although a recent survey showed a link between the rate of a digestive disease and the extent of fecal pollution of water, the disease in question was only minor; the relative risk is too low to ascertain, except by a statistical study.

Serious water-related epidemics are very rare, and the rural population is not conscious of this danger.

In the absence of grouping of distribution systems, treatment techniques may be considered that are easier to monitor and closer to the points of distribution. Disinfection by ultraviolet radiation is proposed more and more frequently.

Pending the availability of disc filtration systems that are now being studied and are proving promising, there is perhaps a case for reconsidering well established techniques such as residual disinfection.

There may also be a case for making the consumers themselves more responsible by giving them fuller information on the risks that may be expected and by providing them with simple devices for monitoring the quality of their water by themselves.

The participants drew attention to the following points:

- it is possible to use combinations of disinfectants, on the one hand to treat water for pathogenic bacteria and on the other to keep a residue in the system;

- several solutions may be envisaged for small systems: install a detector at each small catchment point and fit it with an alarm system; group small scattered networks together within organizations and thus increase the availale resources; and use slow sand filters.

5.4 Quality criteria

5.4.1 Pesticides

The gradual deterioration in the quality of groundwater and surface water owing to increasing concentrations of organic micopollutants, particularly pesticides, herbicides and fertilizers, has been a problem of constant concern for WHO, and the data on the toxic effects of these substances on man are being revised at the request of several Member States in the Region.

This revision is an integral part of the updating of the WHO guidelines on drinking-water quality and is to be carried out as a collaborative programme of the Regional Office and WHO headquarters. Several national institutions outside the Region, such as the environmental protection agencies of Canada, Japan, the United States, etc., will be participating in the revision.

The Regional Office, assisted by the Italian Government, has already undertaken the revision of several herbicides (Alachlor, Atrazin, Bentazon, MCPA, Molinate, Metalachlor, Pendimenthalin, Propanil, Pyridate, Simazine and Trifularin). The results of this exercise have been published in reports issued by the Regional office.

Following a WHO consultation in Geneva, a protocol on the procedure for the revision during the coming years has been drawn up. A provisional list of organic and inorganic pollutants has been drawn up, taking present priorities into account. With regard to pesticides, it has been decided to study products for which no "guideline value" has been set up to now, products whose quality criteria were defined provisionally, and pesticides for which the present toxicological knowledge suggests that the existing norms should be revised.

The participants stressed the importance:

- the need for much stricter control of the application of these products (pesticides, herbicides, fertilizers); the application, whether air or surface, should be supervised more carefully to check whether the quantities per hectare are appropriate, and thus avoid any risk of accidental pollution of rivers, man or animals;

- the need to improve the equipment and techniques for application of agrochemicals that are rudimentary compared with the present analytical equipment and techniques for detecting micropollutants in the environment.

5.4.2 Lead and lead poisoning

Water-related lead poisoning found in the Lorraine region of France is due to the combination of aggressive water and lead plumbing. The poisoning particularly affects the elderly, for reasons connected with the metabolism of lead. The symptoms are very different from those of work-related lead poisoning.

For this reason, the medical profession has had difficulty, at least at the outset, in making a diagnosis of water-related lead poisoning in patients who have absorbed small doses of lead over long periods.

From the epidemiological standpoint, the geographical distribution of cases proves, if that is still necessary, that the existence of aggressive water and older housing constitutes an important risk factor. Over 400 cases of water-related lead poisoning have been diagnosed in the Lorraine region, and, in less than four years, more than half the population at risk has been protected by setting up water treatment plants.

Clearly, this phenomenon is not peculiar to Lorraine. Studies carried out in the United Kingdom (Scotland) have revealed the same problems, and studies now under way in the Massif Central region of France suggest that it, too, could be exposed to this type of risk.

The approach adopted by the French health authorities has consisted of pooling the efforts of professional people in many different sectors (medical doctors, engineers, statisticians, etc.) and ensuring close involvement of the public and elected representatives. It was found that this approach brought a rapid improvement in the health of the population.

Analysis of water-testing results in the French department of the Vosges has shown several problems:

- a certain psychological reluctance to investigate the relationship between lead content and lead poisoning;

- the scale of research needed to investigate this relationship;

- the difficulty of ensuring that health information is disseminated and that it is credible;

- the influence of sampling methods and sites on the lead concentration findings (sampling in the system or at the tap, when first turned on or later, etc.);

- the difficulty of establishing responsibility, particularly in the case of complaints;

- the fact that the lead concentration in air is much lower than the concentrations that can be found in water.

5.4.3 Nitrates

After finding that the concentration of nitrates in certain water supplies was increasing, the French ministry responsible for health, in 1981, issued the following guidelines based on WHO recommendations:

- the concentration of nitrates in bottled water must always be below or equal to 50 mg/l (NO_3);

- the use of a new water catchment should not be authorized unless the water produced has a concentration of nitrates below or equal to 50 mg/l (NO_3);

- water from an existing system with a concentration of more than 100 mg/l NO_3 should not be consumed;

- water from an existing system with a concentration of between 50 mg/l and 100 mg/l NO_3 can be used for consumption, other than by pregnant women and infants aged under six months;

- generally speaking, efforts must be made to prevent increases in the concentration of nitrates in water.

At this time, the ministry responsible for health made a national assessment of the concentration of nitrates in water supplies, and the results showed that:

- for 80.44% of the population, the concentration was lower than 25 mg/l;
- for 17.38%, the concentration was between 25 mg/l and 50 mg/l;
- for 2.42%, the concentration was between 50 mg/l and 100 mg/l;
- for 0.06%, the concentration was above 100 mg/l.

The Hénin report, issued in 1981, found that:

- agriculture plays a key role in introducing nitrates, although urbanization and industry also contribute to the problem;

- there are still considerable gaps in knowledge about the problem;

- the phenomena are extremely complex and, in particular, the mineralization of nitrogen is a difficult process.

In France, efforts have been made to control pollution by nitrates from agriculture, especially by the Government, and an organizing committee for the removal of nitrates (CORPEN) has been set up. It groups together all the people concerned by the problem and is active at three levels:

- a global approach;

- comprehensive action;

- a rational programme for improvement of knowledge, continuous monitoring of the situation, information-sensitization-training, improvement of agricultural practice, and measures against individual cases of pollution.

A survey now being analysed shows that, since 1981:

- all cases where the concentration of nitrates was higher than 100 mg/l have been dealt with, with very few exceptions;

- the population served by supplies with a concentration between 50 mg/l and 100 mg/l has not increased, although the number of systems involved has grown.

Following discussions, the participants agreed that:

- the phenomena are complex and poorly understood, and many parties are involved;

- there is no firm relationship between what occurs in the ground and on the surface;

- it is difficult to use the figures in relation to the norm, which is regarded as an upper limit by the population;

- test results vary according to the piezometric level of the aquifer and the sampling conditions;

- action up to now has taken the form of the issue of recommendations to farmers and group efforts financed by the state.

5.4.4 Aluminium

The presence of soluble aluminium in public water supplies is due essentially to the use of aluminium salts to treat water.

To avoid deterioration of water in systems (post-flocculation effects), norms have been developed by the countries of the European Community (guideline value of 50 µg/l and maximum permissible value of 200 µg/l.

A survey of treatment facilities has shown that the above norms are sometimes exceeded. It is only by correct adjustment of pH during flocculation and appropriate design and use of filters that water with a soluble aluminium concentration of under 200 µg/l can be delivered.

However, some water uses (dialysis) require lower concentrations of aluminium (under 30 µg/l).

For each haemodialysis unit, an individual device must be installed to treat the water.

The activity of aluminium in the process of preparation of water for dialysis depends on:

- the forms in which it is present;
- the phases of the treatment;
- the conditions for operation of the process.

Reverse osmosis generally gives satisfactory results.

The method for analysing aluminium in water that is normally used is atomic absorption (with oven). However, neither the different forms in which aluminium is found nor their respective health impact are identified. It would be desirable to continue research in this direction.

In so far as any exceeding of the recommended limits for aluminium are observed, a system for regular information of haemodialysis users should be set up. This applies, in fact, to any sudden deterioration in the quality of water supplies.

Account should also be taken of the fact that, in some countries, the number of home dialysis units is increasing since this approach to care is less costly. Consequently, the arrangements for information on water quality should be adapted to this situation.

5.4.5 Microbiology

The problems of microbiology were examined in the light of several reports dealing with:

- the study of epidemics recorded in the United Kingdom during the last ten years;
- microbiological monitoring of water supplies in Czechoslovakia;
- an epidemiological survey of slightly contaminated water in rural areas;
- a pilot study of bacterial growth in water supply systems.

(a) Study of epidemics recorded in the United Kingdom during the last ten years

Ninety-nine per cent of the population of the United Kingdom are served by a public water supply system. There are, however, 80 000 private systems, most of them serving communities of less than 500 people.

During the last ten years, eight epidemics have been recorded in relation to public systems (4000 cases) and seven to private systems (1800 cases).

The etiological agents were *Campylobacter*, *Cryptosporidium*, *Giardia*, virus, *Streptobacillus moniliformis* and a chemical contaminant (phenol).

These epidemics showed the importance of drawing up in advance emergency plans for action in the case of accidental pollution, showing what each of those involved should do.

In addition, there is a clear need to make the results of epidemiological surveys public so that corrective measures can be taken by those in charge.

For more effective monitoring of water quality, new microbiological techniques are being studied so as, on the one hand, to ensure a more rapid result and, on the other, to reduce the number of procedures required (assimilable organic carbon, automatic counting of coliforms, epifluorescence).

Six other lines of research concern new disinfection products, global criteria for viral contamination and the capacity of materials in contact with water to promote bacterial development.

(b) Microbiological monitoring of water supplies in Czechoslovakia

In 1986, 77% of the total population were served from individual or communal supplies that are of good quality.

Drinking-water must meet criteria laid down by the Czechoslovak norm SCN 830611: drinking-water (0 coliforms per 100 ml, 20 mesophile bacteria per ml water, 0 enterococci per 100 ml).

Changes have been proposed with regard to the adoption of three additional indicators:

- fecal coliforms per 100 ml;
- mycobacteria to be traced in cases of contamination;
- *Pseudomonas aeruginosa*, especially in bottled water and water for infants.

To detect viruses, it seems desirable to use bacteriophages, especially in respect of problems of analysis.

The bacteriological quality of water in public systems is monitored regularly.

The frequency of sampling depends on the size of the population.

The results not conforming to the norm relate mostly to untreated groundwater (mainly presence of coliforms). Microbiological analyses of drinking-water carried out in 1986 show an improvement in water quality compared with the results in 1977-1982.

(c) Epidemiological survey of slightly contaminated water in rural areas

In 1981, a survey by the ministry responsible for health showed that 95% of the French population were supplied with water of good bacteriological quality. However, 2.3 million people were still supplied with water that was regularly contaminated, especially in mountain areas.

An epidemiological survey was carried out in a mountain district so as to determine:

- the effect on health of water that does not conform to bacteriological norms;
- the most representative indicators;
- the link between the level of contamination and the health risk;
- the significance of contamination being permanent or occasional.

The survey showed a considerable risk of consuming non-disinfected water that did not comply with the bacteriological norms.

The risk of disease seems to correlate most closely with fecal streptococci.

In view of the extent and frequency of bacteriological contamination assessed in respect of faecal streptococci (FS), it is becoming necessary to think in terms of a "maximum permissible value".

For an acceptable relative risk set at 2, a concentration of 6-10 FS/100 ml must not be exceeded even once and one of 15 FS/100 ml in more than 20% of samples.

The study will be continued on the reliability of systems for disinfection of small community water supplies and on the health risks of consuming disinfected and safe water complying with the usual norms (absence of indicator microorganism of fecal contamination).

(d) Pilot study on bacterial growth in water supply systems

The presence of common microorganisms in high concentrations in public water supplies poses problems both to the health authorities (interference in detection of health indicators) and to suppliers (development of invertebrates, increase in corrosion owing to the formation of biofilms, effects of taste and odour).

The reasons for this type of growth, especially bacterial, are numerous and fairly well known (insufficient treatment of the water, poor hydraulics of the system, external contamination, spread of damaged bacteria, nutritive elements allowing the growth of bacteria, low concentration of residual chlorine, characteristics of the support materials).

It is therefore necessary, above all, to classify these different criteria by order of importance or to assess the degree of their interaction, so as to decide objectively on measures to be taken to correct the situation, either during the water treatment process or within the actual distribution system.

For this purpose, GIP STELOR has been conducting a study since December 1986 on an industrial model set up in the premises of NAN.C.I.E. and composed of cast iron-cement pipes arranged serially in the form of six loops, each 31 m long.

The first results show that:

- water with a low concentration of biodegradable organic substances (about 10 µg/l of assimilated organic carbon) allows, in the absence of residual chlorine, the growth of bacteria in concentrations as high as 10^6 bacteria per ml;

- during the first 40 hours of circulation of the water in the pipes, the number of bacteria doubles approximately every ten hours (rapid multiplication); after this, the doubling time increases sharply and is around 231 hours;

- the total count criterion is very sensitive, i.e. during the first hours it accurately reflects the bacterial growth; however, it is less useful once the time spent in the pipes increases beyond several days, since the counts on gelose fall quite appreciably even though the bacterial population is, in fact, still there;

- for longer periods spent in the pipes (more than three days), the reduction in available nutrients is reflected in an effect on the cellular structure and the release of organic molecules into the water; under these circumstances, one must suspect a model for growth of the bacteria in the system described by an attenuated sinusoid with, successively, phases of growth followed by release, then again growth, etc.;

- the formation of biofilms is due to several phenomena: adhesion of cells to the sides of the pipes, removal by the hydraulic flux, growth of bacteria in the water, etc., but the formation of the biofilm is best explained by the adhesion factor; in the same way, the factor of the nature of the materials in contact with the water seems less important;

- freely available chlorine at concentrations as high as 2 mg/l has very little effect in inactivating biofilms and requires several days of activity before producing a partial removal;

- from the preliminary studies carried out, it seems that freely available chlorine at concentrations of 0.1 mg/l does not prevent bacterial growth in water.

There is no question of drawing conclusions at this stage of the research, but rather stressing yet again the absolute importance of controlling the growth of heterotrophic bacteria and the great difficulty of doing this in a correct and consistent way in view of the strong affinity of bacteria for organic substrates and their relative capacity to resist chlorine.

The participants drew attention to the following points.

The questions raised by the interrelationship between bacteriological quality of water and its effects on health are linked to the need for epidemiological studies to validate the indicators and the methodology for their application. However, the notion of indicators should be clarified in terms of:

- indicators of raw water that represent a correlation between contamination and health risks;

- indicators of effectiveness of water treatment;

- indicators of quality of distribution.

The number of indicators used is, in fact, very small, necessitating a revision and some in-depth study.

A distinction should also be made between:

- indicators that are validated in relation to an endemic risk;
- indicators of recent contamination, present during an epidemic.

It is essential that studies should be continued with a view to clearly defining the different indicators and the scope of their validity. The choice of indicators should be explained.

A very full discussion on the report dealing with the microbiology of water supply systems gave a clearer picture of the future development of this study and a better understanding of the implications.

The question of the effect of fluoridation of water on the population of microorganisms does not fall within the purview of this study, if only because fluoridation is not authorized in France.

The effects of chlorine will be studied in the course of 1988. In particular, an attempt will be made to determine the optimum quantity of chlorine that would rule out any possibility of survival of microorganisms. Already, the first observations seem to cast doubt on the present treatment methods.

Mention should also be made of the effect of hydraulic variations on the formation and resistance of biofilms. It seems, without prejudging the findings of the studies that are to be conducted on this question in 1988, that the hydraulics parameter does, in fact, govern the biofilm, but its significance has still to be determined.

5.5 Sanitary monitoring of water quality

In the country reports, frequent mention was made of the conditions in which water quality monitoring is carried out. This monitoring generally involves the performance of certain tests at different intervals. The general thinking on this subject was presented in a critical report drawing attention to various improvements that could be made.

In sanitary monitoring, the risks must be identified as accurately as possible before developing control programmes and deciding on parameters to be analysed. This refers particularly to chemical compounds for which there are not at present sufficiently precise and specific indicators.

Examination of test results from sampling points often shows a redundance of certain results and should prompt some thinking about the possible presence of dangerous compounds that have not been sought.

Study of the historical chronology of analytical results from groundwater sampling points sometimes shows that certain elements (such as Ca, Mg, Na, K and So) often occur in a stable concentration. There is then a case for questioning the utility of such frequent measurement of these parameters whose very small variation in concentration does not constitute any health risk and does not show the introduction of contaminants. The only possible advantage appears to be checking on the ionic balance of the constitutents at each test. One is tempted to be less critical *vis-à-vis* bacteriological analyses in view of the acute effects of microbial pollutants. However, when the results from a chlorinated water sampling point show very low turbidity, an acidic pH, a high concentration of freely available residual chlorine and the absence of indicator microorganisms, one is inclined to conclude that bacteriological research, at this sampling point, is of limited interest except possibly to ensure that the contact time of the chlorine has sufficed.

It therefore appears that the number of parameters and the frequency of sampling may be limited when the composition of the water is sufficiently well known and when one is sure that the water supply system does not present any particular risks.

It is well known that one only finds what one is looking for.

With regard to the possible presence of dangerous compounds in the water that have not been looked for, one might mention those test reports concluding that the water is of "potable quality" when it has, in fact, caused such dangerous conditions as lead poisoning or fluorosis.

What is the reason for this contradiction? It is simply that the routine monitoring tests did not include testing for lead or fluoride and that the body responsible at local level was applying a general monitoring programme not oriented to the detection of health risks.

In some situations, it may be necessary to check the concentrations of pollutants that are not yet covered by indicative values. Such decisions should be taken on a case-by-case basis in the light of clear knowledge of the potential pollution and the vulnerability of the water supply system.

There are two reasons for detecting dangerous compounds (or suspected as such) that are measurable but for which indicative values do not yet exist:

- assessment of the risk for the population concerned;
- generation of data for the scientific community (particularly WHO experts) since one of the criteria for issuing an indicative value is frequency of occurrence and concentration in water.

In conclusion, the main purpose of the monitoring is to detect and prevent real or potential faults in a system. The monitoring programme should essentially comprise two aspects of equal importance - risk detection and water analyses - and awareness of the risks should, to a large extent, govern the decision on the type of analyses to carry out.

Apart from some localized initiatives, it seems that the application of this principle should be strengthened and generalized in the spirit of the health surveys recommended by WHO.

The use of unduly rigid programmes of analyses, as determined by the local authorities, cannot take proper account of the diversity of local situations and, hence, the risks related to each water supply system.

Monitoring, in terms of adequate identification of the risks, is a difficult task. The risks are difficult to demonstrate with regard both to resources and to treatment or distribution. This task requires resources but also instructions from the responsible authority.

Resources include the availability of properly equipped and competent laboratories as well as the possibility of analysing the different types of risk. The latter process requires proper circulation of information and could be the subject of methodological guidelines.

The discussion drew attention to the following points:

- there is a need to strike a balance between a minimal programme of analyses and other tests that could reveal existing problems and provide a basis for working out priorities for decisions: the local health workers should have quantified data, both local and from the literature,

the latter serving as reference figures (these data can be used to inform and, if necessary, reassure the population); and the staff should assess the health risk and analyse the problems with a view to protecting the population;

- for the purpose of Decade assessment, qualitative details concerning all the parameters, country by country, are not necessary; the goal of the World Health Organization is that there should be motivation to improve water quality; to describe the efforts made, each country should therefore have a minimum of qualitative data at its disposal.

6. Information systems

6.1 Data collection and processing

A computerized information system developed in France was presented to the meeting.

The French environmental health services have a staff of 1300 technicians and about 20 sanitary engineers. They are active in numerous interrelated fields: water, housing, waste, nuisances, food.

Water is covered by two forms of monitoring:

- statutory monitoring: the tests are carried out by approved laboratories and the results are sent to the health and social authorities in the departments and regions of the country;

- auto-monitoring: carried out by the supplier.

The information system has three purposes:

- to meet the needs of other services: visual presentation and synthesis of results, collection, storage and treatment of data;

- to inform the authorities and health professions;

- to enable the preparation of regional and national assessments: decentralized data processing system, use of a standard language.

A general and global approach to the environmental health activities as a whole has made it possible to introduce computerization.

The systematic approach is based on the notion of "use", which is common to all environmental questions; it makes it possible to localize, to characterize, to analyse and to quality.

Computerization was introduced in two phases:

- collection of information;
- establishment of a linkage with quality.

The use of data processing methods in information systems, on the one hand, facilitates daily management and, on the other, provides a support for decision-making in normal and even emergency situations.

The introduction of such systems presupposes:

- on the one hand, at the decision-making level, identifying the type of information required;

- on the other, at the level of the administration, deciding how the information will be collected.

6.1.1 Computer demonstrations

Computer demonstrations were given to five workshops constituting examples of the application of the computerization programme of the French health and social authorities in the departments of the country.

First workshop. Audiometry - support in dealing with complaints about noise: recording, analysis, processing and preparation of an official statement of measures.

Second workshop. Bathing in seawater and freshwater - presentation of a record of bathing places and test results recorded during the holiday season over the last five years.

Third workshop. Mapping - demonstration for a given French region of automatic mapping of characteristic features of water supply systems and the linkage between the mapping and numerical or alphanumerical data representative of the characteristics of the water or the administrative set-up of the systems.

Fourth workshop. Mapping of an indicator of quality at different geographical levels for the country as a whole.

Fifth workshop. Text processing.

6.2 Information and the consumer

This topic was introduced on the basis of a report on measures taken by the Netherlands and France.

6.2.1 Information and the consumer in the Netherlands

In the Netherlands, direct information of consumers by the health services is limited as there are other sources of information, particularly newspapers and specialized publications.

Furthermore, there is a law requiring the Government to make public the qualitative data it possesses or knows about.

The board of the water consumers' association, composed of specialists in public relations, issues information on water quality and draws the attention of consumers to the problem.

The water supply companies, which in particular are responsible for monitoring, must also communicate the results to consumers. School health education programmes provide information on the conditions underlying water pollution and its effect on human health.

6.2.2 Information and the consumer in France

Consumers must be informed about the quality of water supplies. In France, a law of 1978 stipulates that the results of water analyses constitute administrative records. Consequently, they must be communicated to anyone who so requests.

More generally, information activities have been developed over the last few years, essentially in three stages.

Activities were undertaken from the start of the 1980s, with the aim of describing the situation of the environment. For this purpose, several reports were issued on the quality of water for human consumption and on recreational waters, taking into account the respective parameters.

The issue of these reports led to requests for additional information from consumers.

To meet this need, educational and illustrated information booklets explaining the regulations were distributed.

Several topics were dealt with in this way: drinking-water, individual sanitary facilities, connections to a sewage system, sanitation in rural areas, hygiene of swimming pools, food hygiene, etc.

This material has numerous advantages:

- it enables both the health worker and the consumer to take the necessary corrective measures without delay;

- it strengthens the role of the relevant professionals as providers of information;

- it projects a modern and positive image of the environmental health services and facilitates harmonization of their work at national level.

To increase public awareness, school information activities have been organized, particularly in a community in Normandy, through collaboration between the Ministry of Education and the local health promotion committee.

At national level, information on the quality of seabathing waters has been developed, using the Minitel telematic system. Some local systems have also been set up in several departments of the country.

This information activity, making use of modern communications techniques, is necessary to put health messages across not only in normal circumstances but also in emergencies.

In conclusion, it should be stressed that the French health services are placing the accent on truth and openness where information on water quality is concerned. However, this is sometimes difficult to achieve and cope with, particularly because of major economic implications.

There is no doubt that the publication of findings must be accompanied by explanations and commentaries that can be understood by most consumers.

From the discussions on this subject, the following remarks may be made:

- clearly, it is necessary to provide information, but this can be difficult owing to two problems in terms of reaching all the target groups and the reaction of those who receive the information;

- two levels should be considered: technical, i.e. whatever the political set-up in force, the information must be adequately disseminated, and social, i.e. it is not enough merely to publish technical information (it must be made meaningful by means of documentation, comments and verbal advice);

- the press can work either with or against the health authorities (wrong interpretation of the information, excessive media coverage of a question, the effect of fashion, overexposure of a topic, etc.);

- consumer associations can play an increasingly important role in information on water supplies.

7. Emergency situations

7.1 Disaster preparedness programme of the WHO Regional Office for Europe

Natural catastrophes have, up to the recent past, been a priority national and international concern with regard to accidents. As shown by the Basle and Chernobyl cases recently, certain types of technological accident can assume the proportions of disasters.

The health problems that arise in these emergency situations go far beyond the restricted framework of rescue and care for victims.

The possibilities of transborder pollution must be taken into account. The phase of fine-tuning of plans is necessary, above all to allow a correct assessment of the needs should the occasion arise. Finally, experience shows that the community must be in a position to deal with the situation using its own means, to the extent possible.

Preparation for emergency situations must be an integral part of the normal development of the primary health care system. This preparation must take account of five classic phases: a "silent" phase, a predisaster phase, isolation, the arrival of outside assistance and rehabilitation work. The essential requirement is that the preparation must be done in accordance with primary health care principles, as defined by the Alma-Ata Conference.

The aims of the preparation are to limit the health effects of the disaster, to protect and, if necessary, restore the health facilities and, finally, to ensure a return to normal as rapidly as possible.

The points to be considered in a disaster preparedness plan are collection of information, analysis of epidemiological data, the making of an inventory of existing resources (health, environmental health, social) and collection of data on the training of aid workers.

Information is needed to prepare plans before a disaster occurs, to evaluate the needs if it does, and to make an assessment after the emergency phase.

An information system should include general data on the community and an evaluation of possible needs in the event of a disaster.

The description of the community should cover the following points: administrative divisions; distribution of the population; sociocultural, geographic and hydrographic data; type of housing; water supply and sanitation systems; food resources; health facilities; transport and communications.

Water supply should be a special feature of the plan, paying particular attention to existing resources, supply systems, major risks of chemical or radioactive pollution, minimum needs, resources in equipment and manpower for treatment and quality control of water, etc.

Information related to the post-disaster phase should make it possible to assess the magnitude of the disaster, its impact on the population, the necessary relief services, the possibilities for health care, feeding and provision of water, the condition of the housing, and the psychological and social situation.

Appropriate information material should be prepared and distributed to all sectors of the population to enable them to manage by themselves in the event of a disaster.

7.2 Transborder pollution

In Hungary, some thought is being given to the problem of transborder pollution, and this has already resulted in the issue of a handbook on prevention of damage caused by water pollution. This handbook is the culmination of research carried out in Hungary over the last ten years and deals mainly with:

- general responsibilities in safeguarding water quality;
- design, organization and execution of work to prevent damage caused by transborder pollution of water;
- economies of manpower in the work of damage prevention.

In Hungary, responsibility for inspection of surface water is not assigned to specific technical staff but to each water user, particularly fishermen. There are special telephone arrangements for giving the alarm.

Research has started on transborder pollution and its effect on the subsoil, but it has not yet produced any results.

7.3 Accidental pollution

In cases of pollution, emergency action is required at two levels: assessment of the risks and extent of damage, and measures for conservation and protection of the population.

As soon as the alarm has been given, the health authorities are confronted by numerous questions: who is the polluter, what are the nature, characteristics and discharged quantities of the pollutant, who can perform the analyses?

For the analyses, many precautions must be taken because of the financial and legal implictions of pollution. It is necessary to be familiar with the quality of water in the river or other source before pollution and the circumstances in which sampling and analyses are required.

A technical review of the situation enables the authorities to take appropriate measures to protect the population, bearing in mind local conditions, available resources and the risk to the population.

For a more effective reaction, and even prevention of accidental pollution, different measures may be taken:

- improved security in the manufacture and transport of certain chemicals;
- better protection of drinking-water sources;
- networking of water supply systems to enable them to derive water from different sources.

In many European countries, human, analytical and, above all, methodological resources are used to deal with emergency situations. Such situations, whether they are national or international in scope, may be natural or man-made (particularly major technological accidents).

Intervention plans are drawn up in such a way as to take account of the different phases in the evolution of a catastrophe and the available local knowledge and skills.

In this respect, the organization of national structures is so conceived as to be able to deal independently (during the initial phase) with a disaster occurring in the country before it is necessary to call in outside assistance.

Certain countries affected by transborder pollution have entered into cooperative agreements, especially on water protection.

At international level, UNDRO and WHO have intervention arrangements, and detailed technical material has been published or will be shortly.

The participants stressed the following points:

- the environmental health workers involved should be trained in emergency response;
- the most important and effective action in an emergency is that taken by the regular local workers and the population itself;
- preparation for taking measures in emergencies should cover such aspects as knowledge of public facilities by the population and by the local workers; routine procedures of the local workers; knowledge of the local epidemiology, the competence of local experts, and existing technical material; and psychological and social factors affecting interventions in abnormal situations.

Finally, to carry out the intervention effectively, provision must be made for replacement of the teams, since fatigue adversely affects efficiency and decision-making.

8. Recommendations

8.1 International level

(1) The participants recognized that the assistance provided to countries by the United Nations agencies in the field of water supply and sanitation is useful, and expressed the wish that, in developing countries, this aid should be continued and strengthened to the extent possible.

For the European Region, the participants from industrialized countries recognized and stressed that special attention must be paid to problems of quality without, however, neglecting the quantative problems that have still to be solved.

(2) WHO should continue to help countries to define their own objectives in relation to the Decade and to prepare assessments enabling them to see where they stand *vis-à-vis* these objectives and those of the Decade.

(3) The participants noted the proposals by the Regional Office concerning evaluation criteria for the Decade in the European Region. To enable the preparation of a proper assessment of the Decade in 1990, they considered it essential that the Regional Office should organize, during the first six months of 1988, an expert meeting to finalize the proposals. At this meeting, special attention should be paid to the terminology used in the evaluation instruments. All the participants recognized the value of such a document for post-Decade preparations and for the development of programmes of action by the United Nations agencies and nongovernmental organizations.

(4) Because responsibilities are often decentralized and numerous partners are involved, there have been many shortcomings in the information collected up to now concerning the implementation of the Decade in countries. The participants considered that the Regional Office should ask each country to provide it with details of the national or local information networks which, in collaboration with the competent government authorities, would allow better collection of data needed for evaluation of the Decade, in cases where this has not already been done.

(5) The participants recognized the great value of the WHO monographs series on different drinking-water quality criteria.

They expressed the wish that the monographs should be regularly updated and that new publications should be produced to cover the largest possible number of substances that may be found in water.

(6) In view of the similarity of problems faced in several countries (for instance, nitrates, bacteriology, lead, pesticides, proper use of water, emergency situations), the participants expressed the wish that protocols on sanitary approaches should be proposed by the Regional Office. Since the problems are multifactorial, these protocols should take account of that multisectorality, the involvement of the community, and technical and economic constraints.

(7) The participants expressed great interest in the information communicated by the Regional Office with regard to updating the guidelines on pesticides and related substances. They expressed the wish that, pending international harmonization, protocols on sampling and analytical techniques should be supplied to the countries.

(8) The participants called for better coordination and harmonization by the Regional Office of the programmes of work and activities of the collaborating centres. The Regional Office should ensure wide dissemination of the research carried out by the centres.

8.2 Country level

(1) The participants recommended that countries that have not already done so should define or reformulate their objectives in relation to the WHO regional programme for the Decade in Europe. This recommendation is particularly important in providing a framework for proper assessment of the Decade and for post-Decade preparations.

(2) Countries should promote coordination of the different partners involved in the Decade so as to facilitate a multisectoral approach to the activities and analysis of results.

(3) Countries should take the necessary measures to evaluate their situation in relation to the objectives they have set. If necessary, they should establish a Decade evaluation committee in conjunction with the competent government authorities.

(4) Each country should set up a national information system to allow the collection of data on the Decade at local, regional and national levels.

(5) The participants requested that countries should make the necessary technical, administrative and financial arrangements to enable them to reply appropriately to surveys conducted by WHO for evaluation of the Decade.

(6) The participants expressed the wish that countries should use and widely disseminate knowledge gained in connection with accidents or epidemics and, more generally, in sanitary follow-up of such situations.

(7) The participants recommended that countries should increase, to the extent possible, the application of data on water supplies, sanitation and recreational waters and should endeavour to link them, whenever possible, to data on health status and development. The use of mapping techniques was considered an effective approach to ensuring such application.

(8) The participants recommended that countries should adapt their monitoring, research and action to different situations, and especially the risks to which the population is exposed.

(9) In view of the great variation in the use of pesticides and fertilizers, the participants recommended that countries should adapt sanitary control measures to different regional situations.

(10) Member States should keep the population informed about the situation with regard to water supply and sanitation. They should also provide basic training for local staff and central services for emergency situations. They should endeavour to assess the real impact of these measures.

(11) The participants recommended that the countries should, through active support, promote the work of the WHO collaborating centres for the Decade and make optimum use of their research.

Annex 1

PROPOSAL FOR STATISTICAL ASSESSMENT OF THE INTERNATIONAL WATER DECADE

GENERAL STATISTICS

Population

Population living in urban areas
Population living in rural areas
Total population
Population increase (%)
Life expectancy at birth

WATER STATISTICS

Groundwater resources (estimated)	km^3
Surface water resources (estimated)	km^3
Artificial aquifer recharge	km^3/year
Annual rainfall	mm/year
Direct evaporation	km^3/year
Run-off	km^3/year
Infiltration	km^3/year

Origin and use of water

Groundwater	km^3/year
Surface water	km^3/year
- for domestic purposes	km^3/year
- for industrial and commercial use	km^3/year
- for agriculture	km^3/year
- for municipal and other uses	km^3/year
- losses	km^3/year

Drinking-water supply

Total population served by a piped public water supply	%
Percentage of urban population with piped water in the home	%
Percentage of urban population without piped water but with reasonable access to public standposts	%
Percentage of urban population served by a private system (well, cistern, other)	%
Percentage of rural population with piped water in the home	%
Percentage of rural population without piped water but with reasonable access to public standposts	%
Percentage of rural population served by a private system (well, cistern, other)	%
Percentage of rural population with difficult access to drinking-water installations	%
Total piped public water supply for drinking purposes	km^3/year

RELIABILITY OF WATER SUPPLY

(a) Frequency of stoppages of supply:

very high .....
high .....
medium .....
rare .....
nil .....

(b) Are stoppages: total ..... or partial .....

Industrial water supply: direct abstractions

Total supplied from inland surface water . . . . . km^3/year
Total supplied from groundwater . . . . . km^3/year
Total supplied from coastal water . . . . . km^3/year

Agricultural use: direct abstractions

Total amount abstracted for irrigation . . . . . km^3/year
Total amount abstracted for agricultural use (e.g. food industry) . km^3/year

QUALITY OF DRINKING-WATER

Are national drinking-water quality standards available?

Percentage of population supplied with water complying with national standards . . . . . %
Percentage of population supplied with water complying with other international standards (EEC) or guidelines (WHO) (please specify) . . . . . %

Total number of water quality analyses carried out each year

Percentage of water quality analyses complying with the water quality standards or guidelines in use . . . . . %

WASTEWATER DISPOSAL

Percentage of urban population served by a sewage system . . . . . %
Percentage of urban population served by other adequate means (septic tank) . . . . . %
Percentage of urban population lacking adequate disposal means . . %
Percentage of rural population served by a sewage system . . . . . %
Percentage of rural population served by other adequate means (septic tank) . . . . . %
Percentage of rural population lacking adequate disposal means . . %

SEWAGE TREATMENT

Type of sewage	Population equivalent				
	Primary	Secondary	Tertiary	Quarternary	Raw sewage
Municipal					
Industrial					
Mixed					

SEWAGE EFFLUENT DISCHARGE (IN PERCENTAGES)

Type of treatment	Into the sea	Into surface water bodies	On to farmland
Primary			
Secondary			
Tertiary			
Quarternary			

SLUDGE DISPOSAL

Tons dry solid

- Into the sea . . . . . .
- Into surface water bodies . . . . . .
- On to farmland . . . . . .
- Landfill . . . . . .
- Incinerated . . . . . .
- Other disposal . . . . . .

UNIT COSTS OF CONSTRUCTION AND PRODUCTION

	Water supply	Construction	Production
(a)	Urban house connection	US$	US$/$m^3$
(b)	Urban standpost	US$	US$/$m^3$
(c)	Rural house connection	US$	US$/$m^3$
(d)	Rural standpost	US$	US$/$m^3$
(e)	Average urban water tariff		US$/$m^3$
(f)	Average rural water tariff		US$/$m^3$
	Sanitation		
(a)	Urban sewer connection	US$	
(b)	Urban septic tank	US$	
(c)	Urban latrine	US$	
(d)	Rural sewer connection	US$	
(e)	Rural septic tank	US$	
(f)	Rural latrine	US$	
(g)	Average treatment cost of municipal sewage		US$/$m^3$
(h)	Average treatment cost of industrial sewage		US$/$m^3$

INFORMATION ON WATER/SANITATION-RELATED DISEASES

		Cases/year	Outbreaks/year
(a)	Cholera		
(b)	Typhoid fever		
(c)	Bacillary dysentry and amoebiasis		
(d)	Gastroenteritis and other diarrhoeal diseases		
(e)	Hepatitis A		
(f)	Hepatitis B		
(g)	Shigelloses		
(h)	Intestinal infections		
(i)	Other water/sanitation-related diseases		

Annex 2

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